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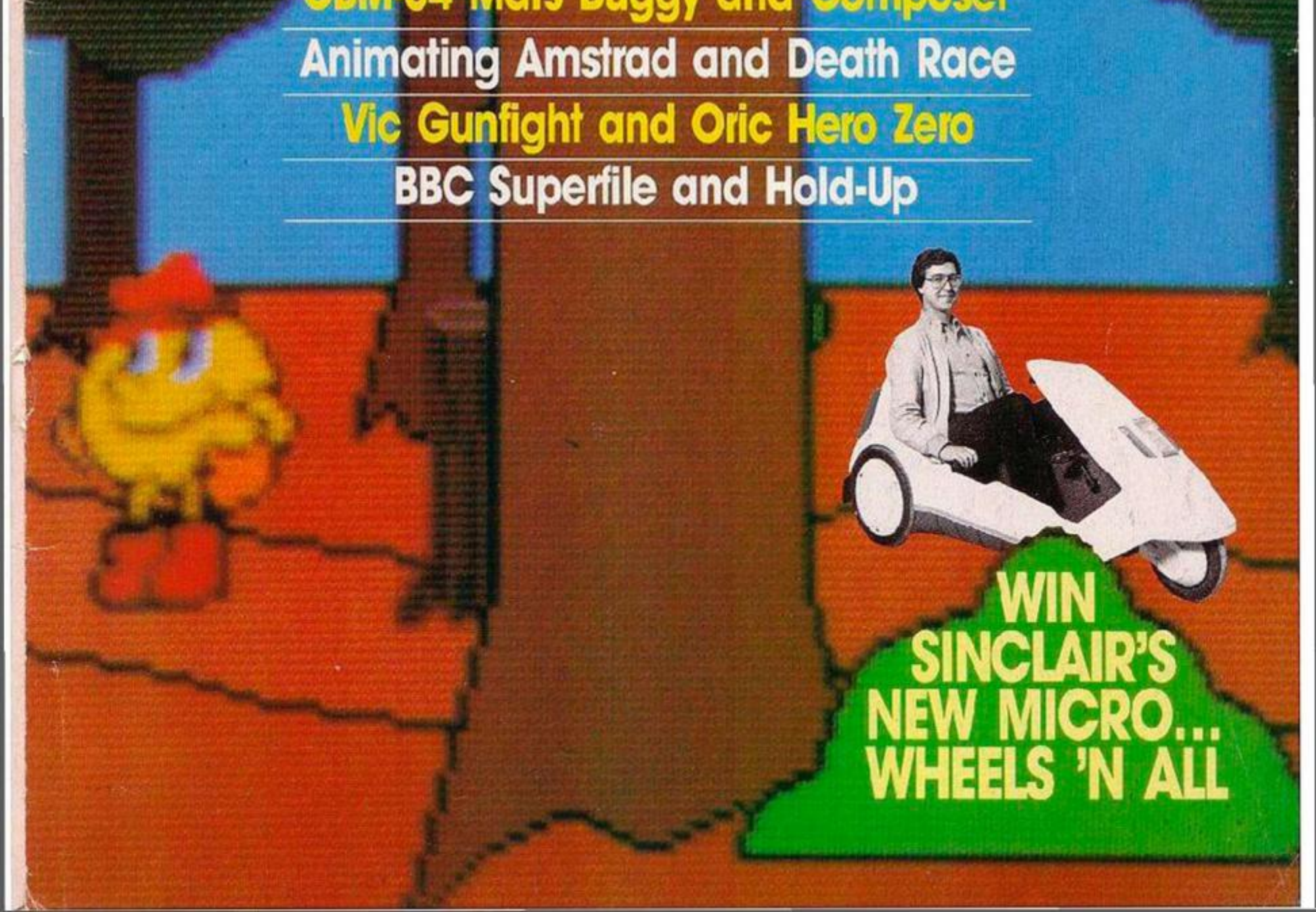
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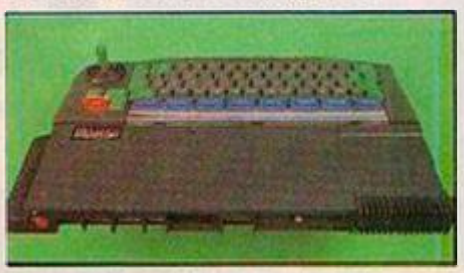
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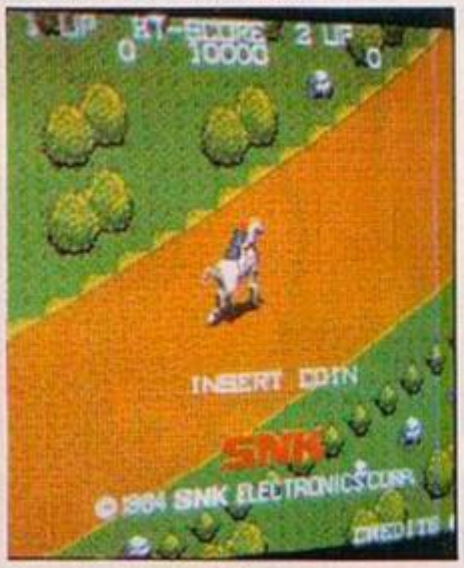
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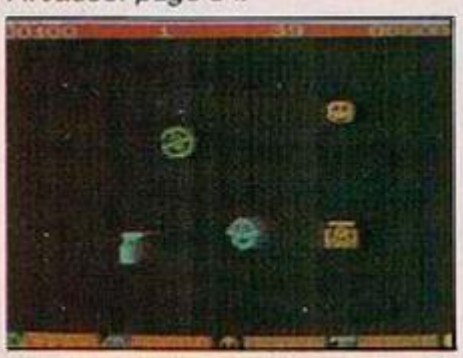
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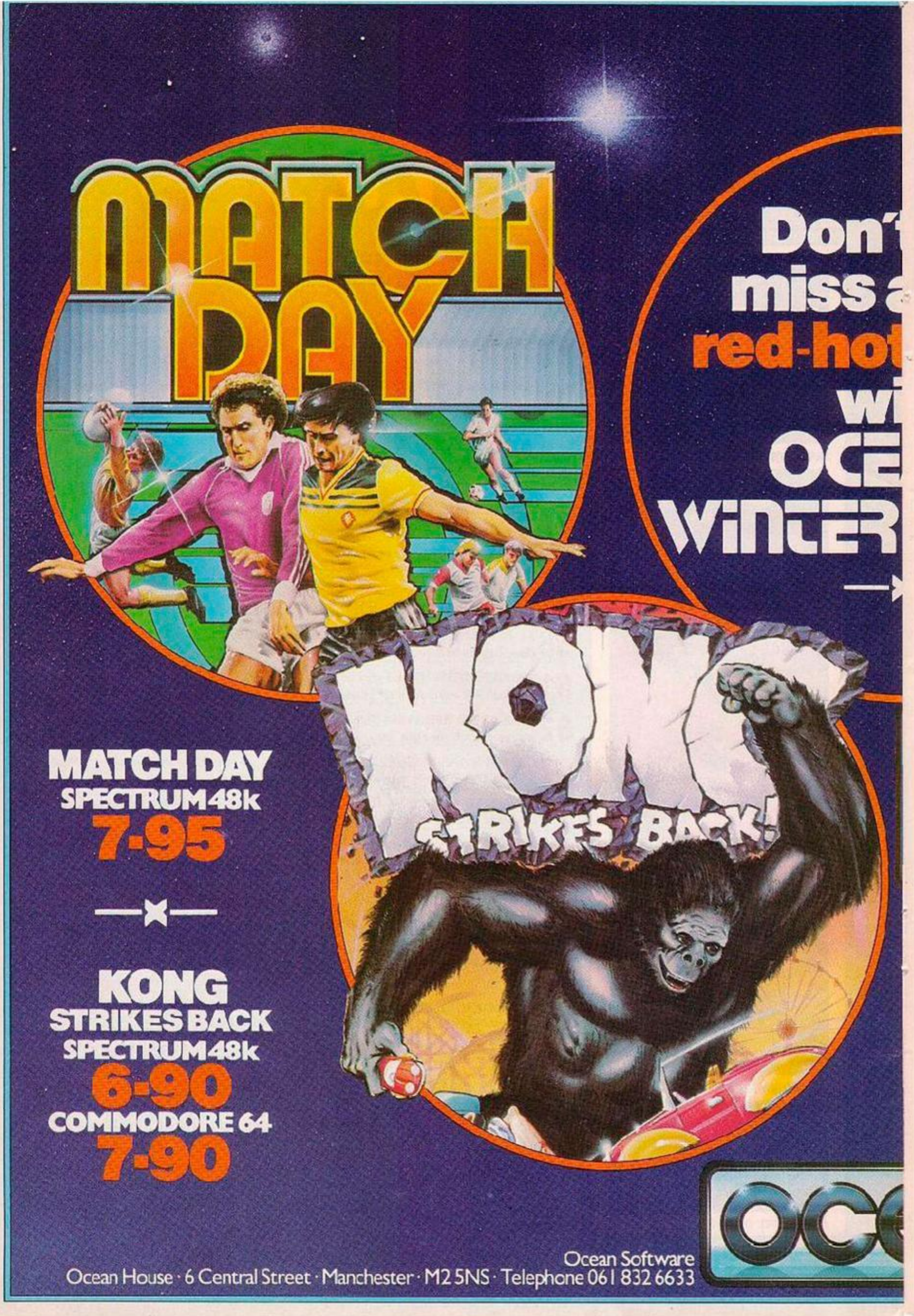
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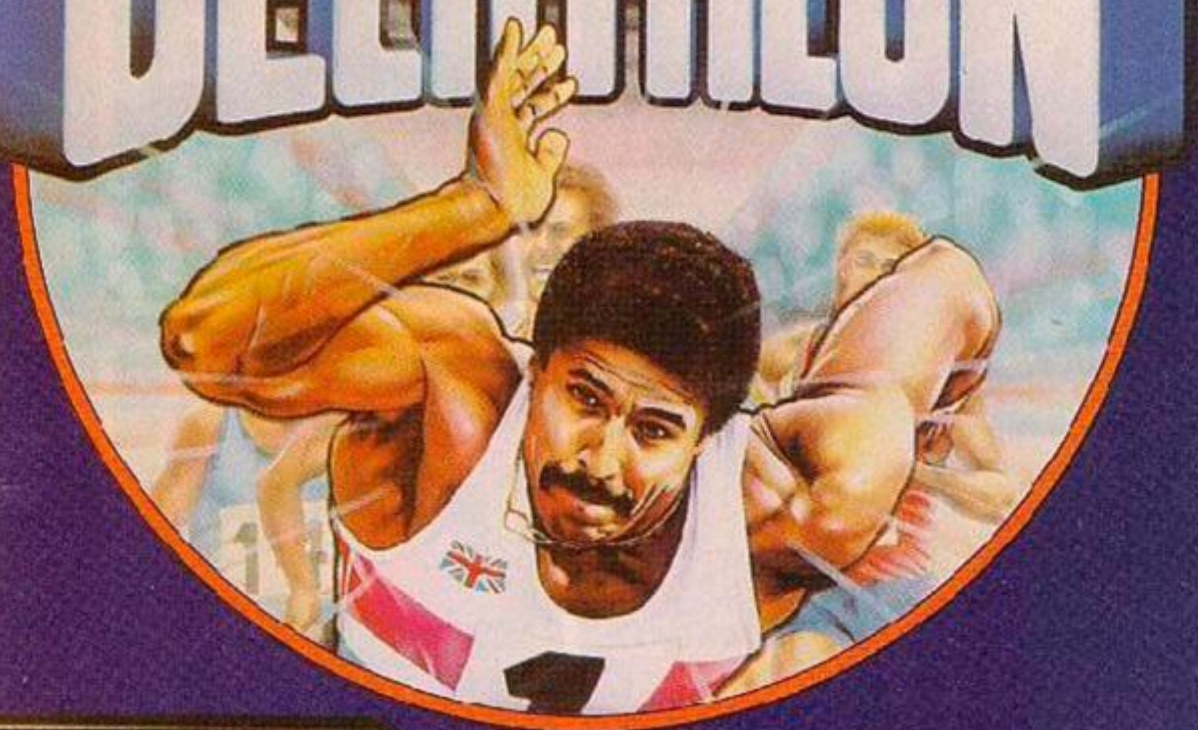
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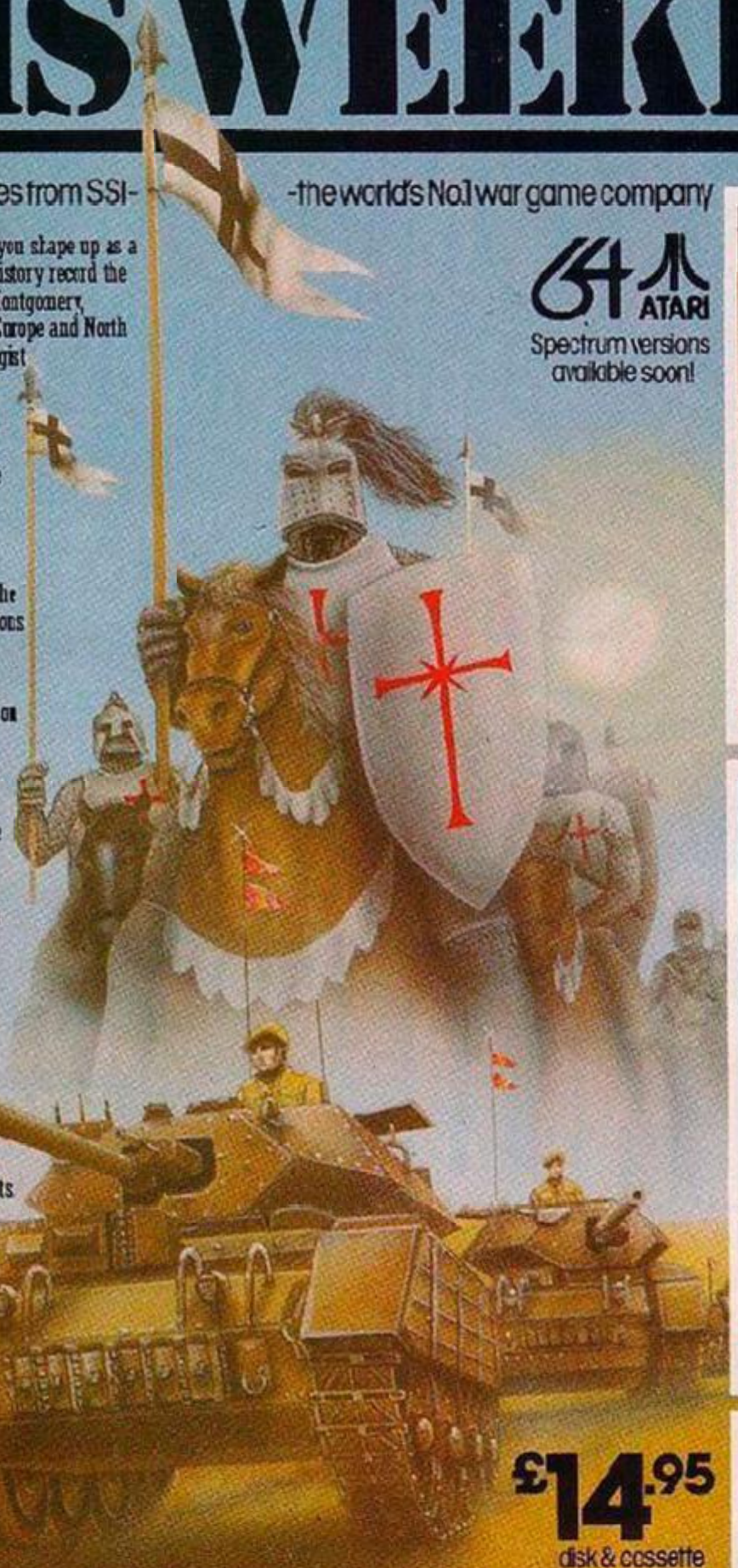
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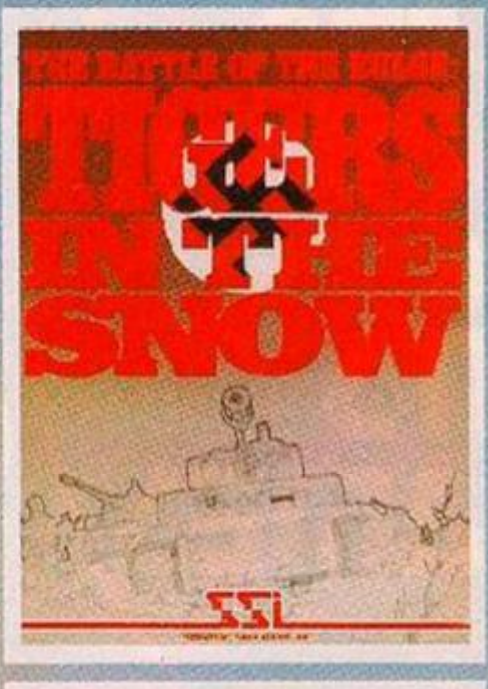
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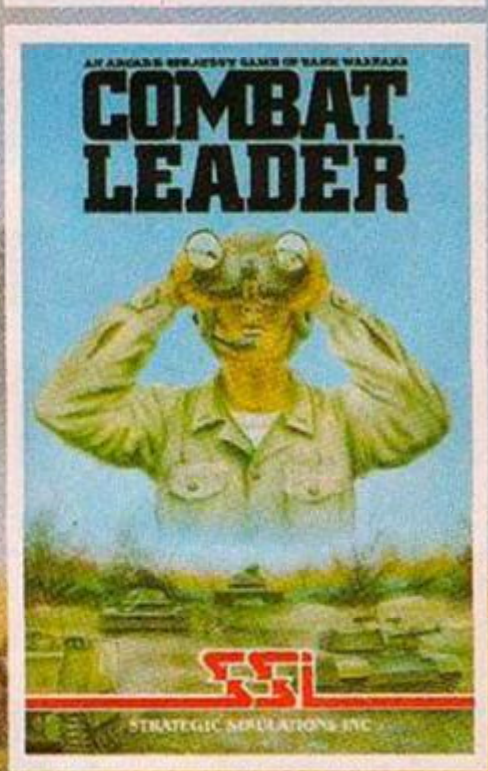
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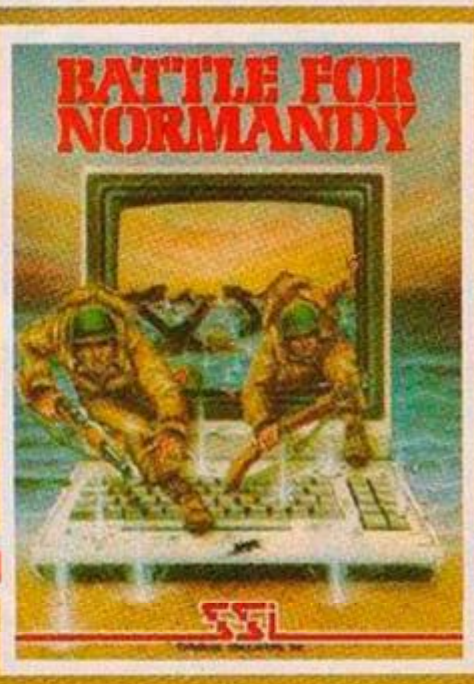


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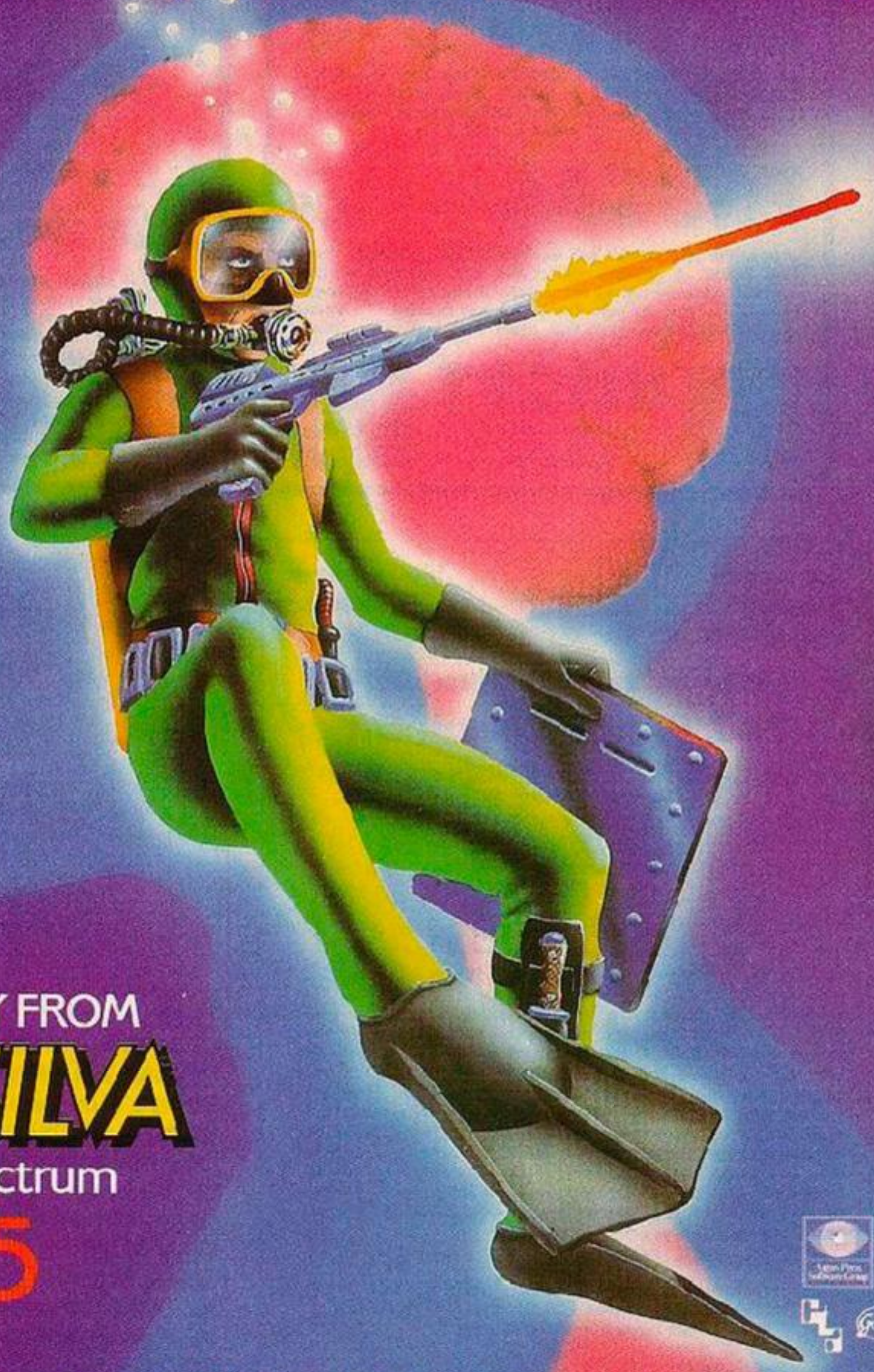
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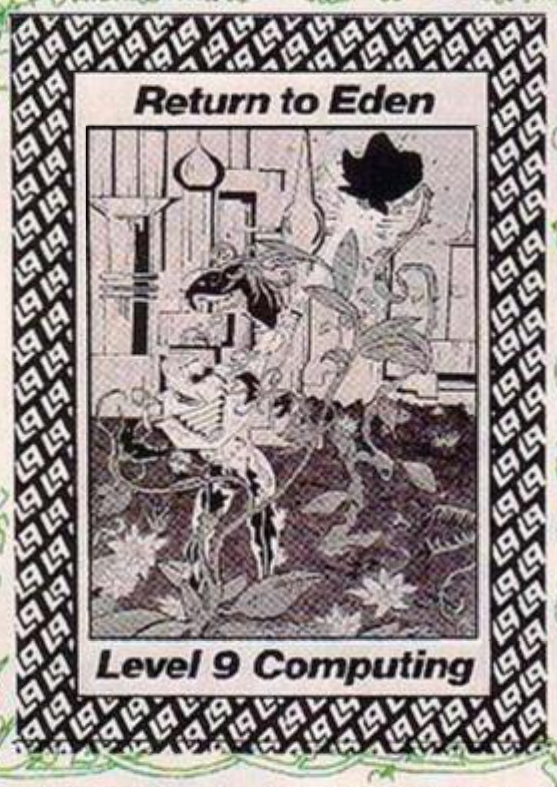
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For example, its graphics have the highest resolution of any home computer bar none.

This is because Acorn specially designed the chip that controls the graphics. And it's among the most advanced chips of its kind.



Indeed, it delivers twice as many characters across the screen as the Electron's nearest rival.

It expands into a system.

With the Electron, even total newcomers have been surprised at how quickly they can find their way into the complex world of computing.

Where many computers have keyboards which are confusing and clumsy to operate, it has a keyboard just like an ordinary electric typewriter's.

And for issuing main commands, there are single entry keys. Instead of literally spelling out the command, letter by letter, you just push the relevant key and it's issued.

There's also a built-in loudspeaker which gives high quality sound.

And what is perhaps most exciting is that the Electron has the capacity to grow with your knowledge and ambition.

With Acorn's Plus 1 expansion module, it can link up with a printer, joy sticks and fast-load cartridge software including View and Viewsheet word processing and spread sheet programs.

With the Plus 3 module, which will soon be available, you'll have a disc drive system and will be able to enjoy all the speed and convenience of 3.5 inch discs.

But let's not get carried away too quickly. You can start using and enjoying your Electron as soon as you get it home.

All you need is your television set and a cassette recorder.



And when it's given you some new ideas about home accounting, it will challenge you to a few games and even spend a few seconds doing your whole family's biorhythms for you.

But remember, although it holds 15 programs, the cassette will only give you a glimpse of the Electron's full potential.

Because the potential is as infinite as your own imagination.

The speed of a business micro.

Some home computers respond pretty slowly to your commands. After you've pressed the keys, they leave you twiddling your thumbs for more than a mere few seconds.

The plodders, however, are a very long way behind the Electron.

In fact, on processing speed, a recent bench test survey ranked



the Electron up with such high fliers as the IBM PC and the Apple III. Both are machines which cost well over £1,000.

It's an astonishing accolade when the Electron makes no greater claim than to be a micro which is designed to become part of the family.

Your starter for free.

With your Electron, you'll receive a free introductory cassette.

It will give you a taste of the exceptional colour graphics. It will show you how the Electron can play and notate music.

No shortage of software.

Although the Electron is still a relative newcomer to the market, the range of software available for it is considerable.

Besides plenty of games, there are many educational programs for children of all ages, from playschool to A Level.

There's a great deal to keep adults occupied, too. From money management to helpful domestic programs, even a range of foreign language programs, teaching the basics of French, German, Italian and Spanish.

And of course, with its simplicity and flexibility, the Electron could soon be



processing programs created and written by none other than yourself.

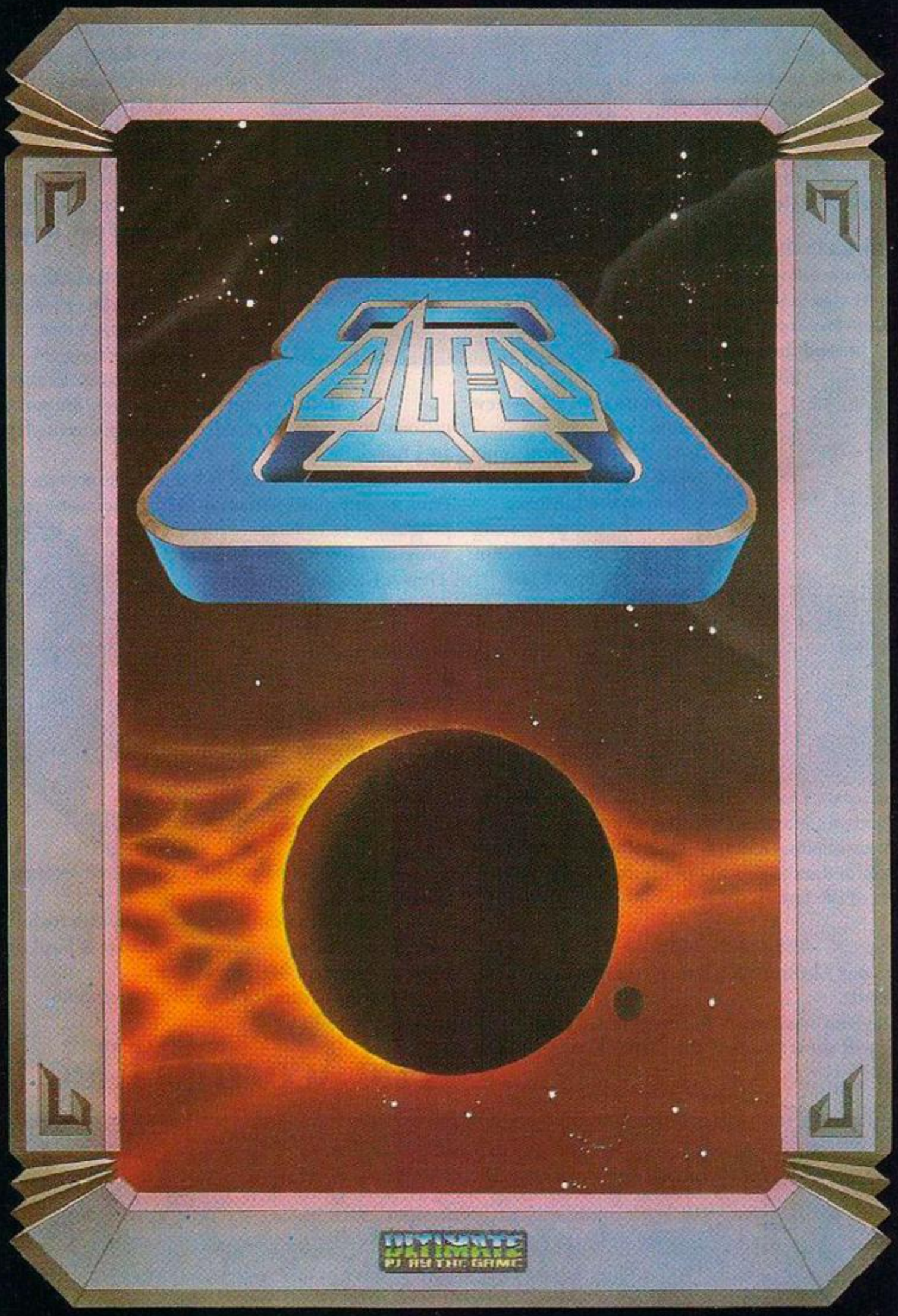
You can find the Acorn Electron with its full complement of accessories and software at local Acorn dealers and major high street stores.

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The Acorn Electron.



48K SINCLAIR ZX SPECTRUM



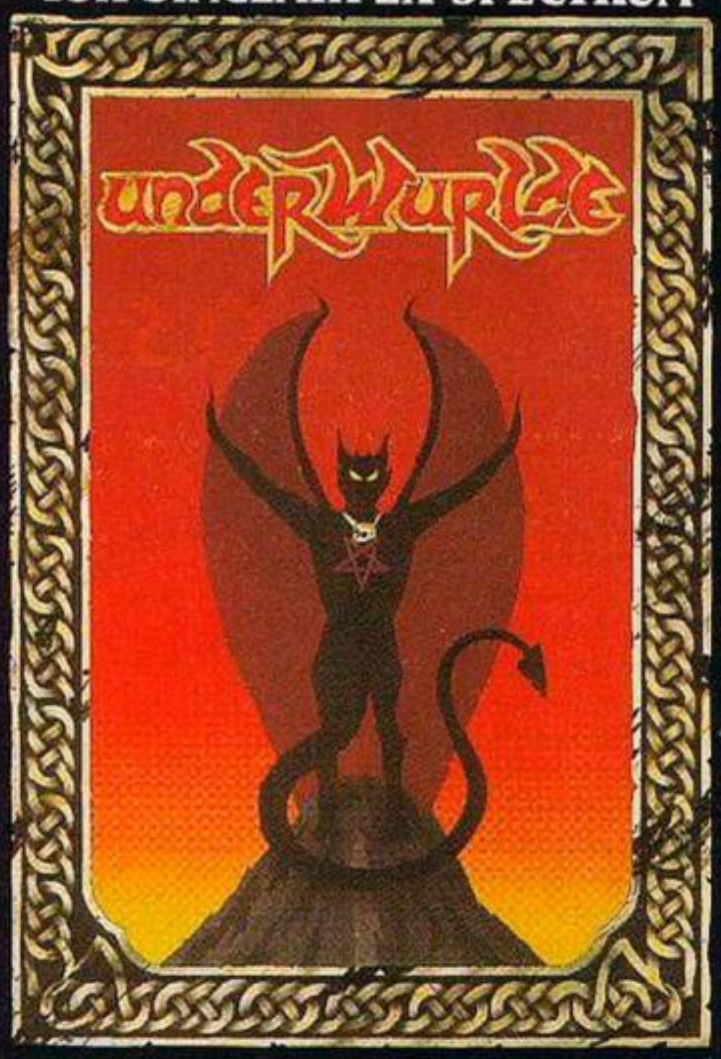
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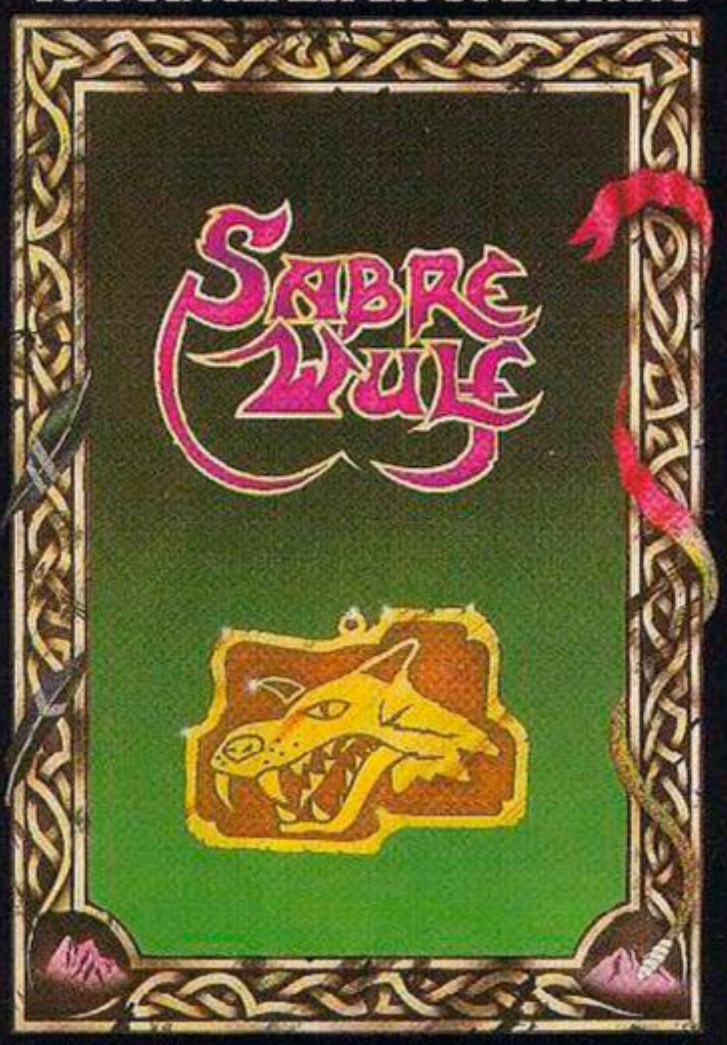
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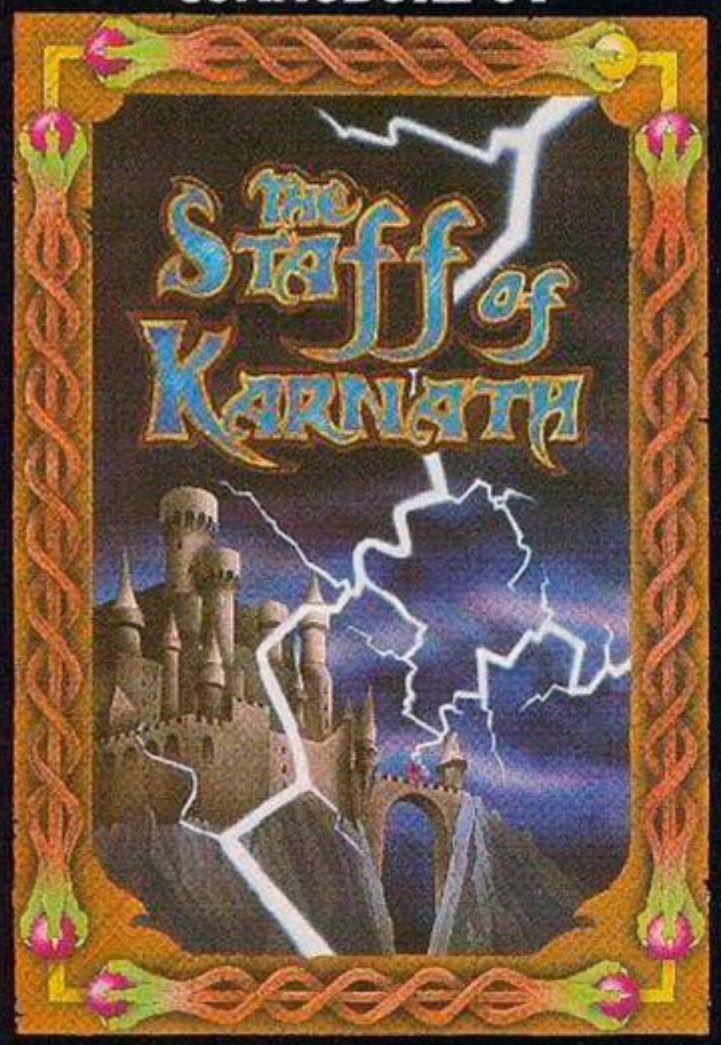
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BBC MODEL B 1·2 OS
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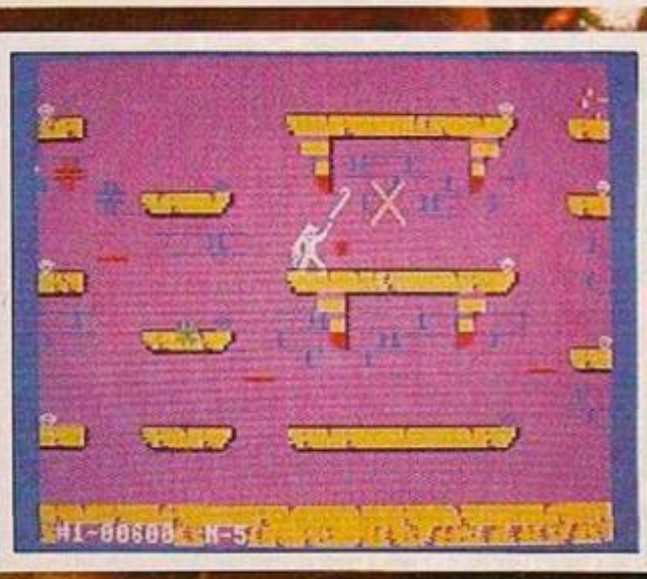
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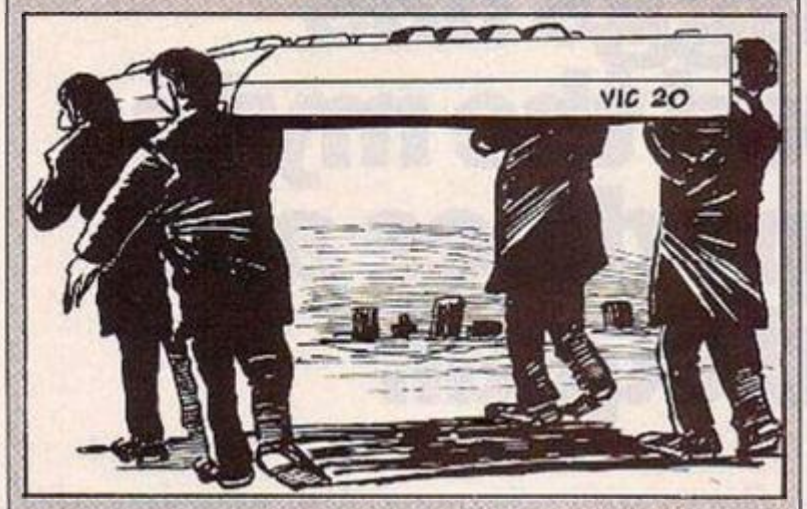
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YOUR LETTERS

EPITAPH FOR ONE OF THE BEST



As a one-time owner of the Vic-20, I felt that I could not let this Grandaddy of computers be put to rest without, at least, a brief eulogy.

Since the Vic-20 was brought onto the market, a lot has changed in the world of computers. Its limited graphical and musical capabilities plus its minute memory did not give it much of a chance against today's 64K hi-res maestros.

Even so, the early days of Vic-computing will always be, for me, the "good old days". Those were the days when you struggled to fit a lot of program into a tiny bit of memory — a thing that every computer-programmer ought to have to do. The mega-memories of today's 64K elephants are asking for sloppy and wasteful programming.

I will never forget the hours I spent typing the latest Basic program from the pages of *Your Computer*, because there was nothing else available. Does anyone do this today? Back in the days of Vic, you spent nights poring over hand-assembled machine code. Compilers were things you dreamt of after your trusty Vic-20 had crashed for the fifth time.

Don't get me wrong, the computers of today are a lot better than the Vic-20 but, somehow, all the fun has gone out of computing, as I knew it.

The computers of today and their owners have a lot to thank the Vic for. I am sure that the passing of this Model T of the computer world will squeeze a tear or two from the eyes of many a computer enthusiast.

Matthew Longham,
West Germany.

GREAT SCORES!

Start with the flattery they said so . . . I avidly read your magazine each month among many other computer magazines and I certainly put it in the first two and I will leave you and the readers to guess what the other title is.

I read with scorn the vast scores claimed by computer gamesters the thousands, hundred thousands and even millions look puny when viewed against the magnificent, astounding 3D, mighty, state of the art achievements that I have obtained. Just read this list and listen to the gasps of wonder from the readers . . .

In Raid over Moscow I have destroyed 10,234 stealth bombers and all of these inside the hanger which I have not managed to get out of yet. In Zaxxon 23,346 jets have hit the wall that scrols toward you at the very start — I simply cannot find the first opening even. On a flight simulator I have crashed 40,000 times at Gatwick and in Solo Flight I actually crashed my CBM-64 by going as high as possible and then diving into Kansas at full speed.

On Flight 737 I cannot even find the damn runway and wander aimlessly about all over the flaming airfield until I go off the edge. In Blue Max for some strange reason if you pull back on the stick you crash forward and by reversing the joystick I can now hit the tree at the end of the runway every time. At the Royal Birkdale golf I went round in 18,000 strokes over par and in International Football I lost 42 nil to the computer at level one.

I could go on for ever but I don't want to make other readers despondent about their own achievements. I just mention that in the Hobbit I have had 14,000 attempts to get the small door open in the very first scene and always end up jumping in the small chest which is always empty. Why do they make these games so easy???

R. Orlandini,
Staviera,
Isle of Wight.

NOT A SYNTH

In many articles and adverts the sound facilities on many computers are said to be the same as those found on synthesisers. This is not the case. In fact, on most computers you can define envelopes, pitches and the noise level, but they are missing a function which sound generators need to have to be called a synth: the ability to change the timbre or amount of harmonics — many harmonics = sharp sound, few harmonics = soft sound. It's usually a low-, high- or bandpass filter that's used to do this.

I'm saying this to warn people who are looking for a synth from making the mistake of buying what they think is a computer-based syntheiser, but which actualy is a computer-based sound generator — I've nearly done it myself: advertisers fault!

As far as I know the only machines which have a built-in synth are these: Yamaha CX5, Commodore 64 and Enterprise.

Johnny Brinks,
Elsinore,
Denmark.

TELSOFT WORKS!

I have just tried two programs, Darts and DataCalc, since keying in Telsoft on Thursday evening. Both came over well — very few bad blocks and I'm very pleased with the results. Micronet is disastrous — I cannot get it to download with anything above a five per cent chance of success.

I have a Universal Modem Adapter which has enabled me to access Micronet and Viewfax in the past. Unfortunately, they have dropped ZX-81 software altogether. The problem with keying in your long machine-code programs is that it is all too possible to get them wrong. The checksum is no proof against getting values in the wrong sequence or overwriting another area of memory.

If you ignore the intricacies of 40 column display shifting etc to accommodate Prestel on a ZX-81 then your class of cownloader is ideal.

Anyway — you may be interested to know that Telsoft is fine on BBC B in Cheshire via an acoustic modem.

Ray Pearson,
Northwich,
Cheshire.

AMSTRAD DATA

I would like to clear up a few points about the Amstrad CPC-464, following information given in the January issue:

■ Pages 145-148: The Sprites article implies the 464 won't scroll its windows. It will scroll, both up and down, any of its text windows. The general form of the required code is:

DOWN Locate n,1,1:print n, "cursor up"
UP Locate n,1,m:print n, "Cursor down"

where n is the channel (window) number and m is the number of rows in that window.

If the whole-screen scrolling is required, the window 0 has not been altered from its start-up definition, then the following is all that is needed:

DOWN Locate 1,1: print "Cursor Up" — or 2 "£(Ctrl) £(Ctrl) K"
UP Locate 1,25: Print "Cursor Down". Obviously this technique does disrupt the cursor position.

■ Page 161: Symbol after 127 would allow re-definition of characters 127-255, not 128-255.

■ Page 173: The circle-drawing routine given in program 2 takes an unacceptably slow 12 seconds to draw one circle. The following takes less than 2½ seconds, and if Step 2 is

Table 1.

FUNCTION	(CHR$) CHARACTER	KEYBOARD	JOYSTICK	SCREEN
Beep (Bell)	7	CTRL G		R
CSR LEFT	8	CTRL H	LEFT	
CSR RIGHT	9	CTRL I	RIGHT	
CSR DOWN	10	CTRL J	DOWN	
CSR UP	11	CTRL K	UP	
CLEAR WINDOW	12	CTRL L		
RVS	24	CTRL X		X
CSR HOME	30	CTRL £		

ZX-81 MICROS DESERVE BETTER

The survey conducted by Sharpey among Open University students, November 1984, *Your Computer* may have surprised a few people. The position of the BBC B and Spectrum as the most owned micros was to be expected, but the third place obtained by the ZX-81 ought to — though I very much doubt it will — make a few publishers and software manufacturers think again about so readily ignoring this pioneer of home computing.

That the machine is outdated I do not deny, but this is surely offset by the extremely low price at which it is now selling. Software and books for the ZX-81 have become extremely rare, while publishers of computer magazines seem to have forgotten that it ever existed.

There are, of course, some exceptions. Most notable are Software Farm, who are producing probably the best games ever seen on the ZX-81 and *Your Computer* whose listings are, in the main, superior to most commercial programs. So I appeal to publishers of books and software for the ZX-81. Please continue to publish, and please let us know that you are continuing to do so via advertisements.

S.P. Kaliszczak,
Lytham, Lancashire.

inserted after the For i% = 1 to 45, an acceptable circle is produced in just 1½ seconds.

```
10 MODE 1:CLS:r% = 100:x% = 320:y% = 200:DFG:ORIG N x%,y%
20 FOR % = 1 to 45:a% = r% * COS(i%):b% = r% * SIN (i%):PLOT a%,b%:PLOT – a%,b%:PLOT a% – b% PLOT – a% – b%:PLOT b%, a%:PLOT – b%, a%:PLOT b%, a%, PLOT – b% a% NEXT
```

■ Table 1 will help new users track cursor up/down control characters as the manual is not particularly helpful on this matter. They can all be used in the same style as CBM's cursor symbols:

■ The 464 manual fails to give an example of how to print a multicolour character. The following will print a wine glass, and characters high and outlined in black on a white background, filled with red wine, standing on a blue mat.

```
10 MODE 1:INK 0,26:INK 1,0:INK 2,6 : INK 3,14 : PAPER 0 : BORDER 0 CLS
20 SYMBOL after 200
30 SYMBOL 200,0,0,254,130,130, 130,130,68
40 SYMBOL 201,40,16,16,16,56,124
50 SYMBOL 202,0,0,0,0,0,124, 124,56
60 SYMBOL 203,16
70 SYMBOL 204,0,0,0,0,0,0,254
80 glass $ = CHR$ (200) + " ←"
90 wine $ = CHR$ (202) + " ←"
100 Mat $ = CHR$ (204)
110 PRINT CHR$ (22) + CHR$ (1): REM turns on transparent mode
120 FOR x% = 1 to 37 STEP 4: FOR y% = 1 to 21, STEP 4
130 LOCATE x%,y% : PEN 1 : PRINT glass$ " ←" : PEN 2: PRINT WINE $ "←" : PEN 3 : PRINT mat $ : NEXT : NEXT
140 PRINT CHR$ (22) + CHR$ (0): REM reset to normal mode
150 PEN 1
```

■ Finally, new users will find useful the use of Ctrl and CSR keys to jump from one end to the other of a long line of Basic during editing. Also not mentioned directly in the manual is the possibility of re-executing a simple Basic instruction in a similar way to the CBM computers.

Cursor up to the line required, "wipe" across it with the copy key, over-typing any changes on the way, and press Erter. The command will be obeyed, without the need for re-typing it, or Copying it to a fresh screen line.

F Murfit,
Crawley,
West Sussex.

CORRECTIONS

There is an error in the hex loader for the Spectrum game, Space Evaders, in the January issue. LIT a=0 at the end of line 70 should be deleted and re-inserted at line 65.

Before typing in the hex loader in January's Dragon program, Reversi, you need to reserve space for the machine code by typing PCLEAR 8.

More machine code was given than is necessary in the listing for CBM 64 Tiradians in January. When the hex loader asks you to input the start position, enter 3780 and ignore the code from 3660 to 36FF.

EDITORIAL

PRICE WAR – HUH! What is it good for? Absolutely nothing. That's what the computer manufacturers would have us believe, but when did the public ever lose out from cut-throat competition in the micro industry?

The last major price battles were fought in 1983 when Sinclair sparked a new conflict by pulling the Spectrum down to £130 and £100 from its original £175 and £125. Commodore answered swiftly with Vic-20 cuts and the whole campaign had fizzled out by that Christmas.

The result? — a lot of satisfied new customers and a body count of computer manufacturers featuring big names like Texas Instruments and Mattel, and several smaller ones such as Grundy and Jupiter Cantab.

All the signs are right for a new round of cuts this year, but this time Atari is the company leading the downward price charge. That may seem ironic — Atari was another of the once-powerful to fall victim in the 1983 wars. It lost $180 million in the last three months of 1983, and those financial wounds lay directly behind its sale to Jack Tramiel in the spring of last year.

Atari had hoped that the XL range of computers would lead to a return to better fortunes. In 1983 few would have expected that the £250 top-of-the-range 800XL would become Christmas 1984's bargain at £130 — and how there is talk of another cut to take the 800XL below £100.

Alone, that would hardly be enough to spell cheaper computers for everyone. But it is one of several movements which could add up to important changes in pricing this year.

How well computers sold at Christmas is the first key. Although the end-of-year boom couldn't be described as disastrous for companies like Sinclair, Commodore and Amstrad, it did arrive very late with all the activity concentrated in the last couple of weeks before the 25th.

That has resulted in larger warehouse stocks of unsold machines than expected.

Japanese dreams of an MSXmas failed to become reality, hit first by a lack of interest and then by the weak pound. Toshiba has already dropped its HX-10 to under £200 and the other MSX makers will be forced to follow suit to get their over-priced machines moving.

Even though Sinclair can outsell his competitors with the Spectrum even at its current price, he is well placed to make cuts if he has to. The profit margins in the Spectrum's prices are large enough for him to move them down a long way even if this time it isn't Sinclair who starts the war. The low chip count in Commodore machines will also permit them to rejig prices if they want to initiate the moves to get the market moving again.

It is an open secret that following the Electron principle Acorn is re-engineering the BBC Micro to reduce production costs and increase margins. That in turn could allow for price cuts. Late-comer Enterprise might also be obliged to look at a new price structure.

The final factor that hints at lower-cost computing is the number of new computers in the pipeline. Commodore as well as Atari have unveiled their latest products — see this month's news pages — and the Atari cuts already mentioned are clearly in preparation for the new machines. Commodore may also reposition the computers in its existing range by dropping prices and possibly machines.

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

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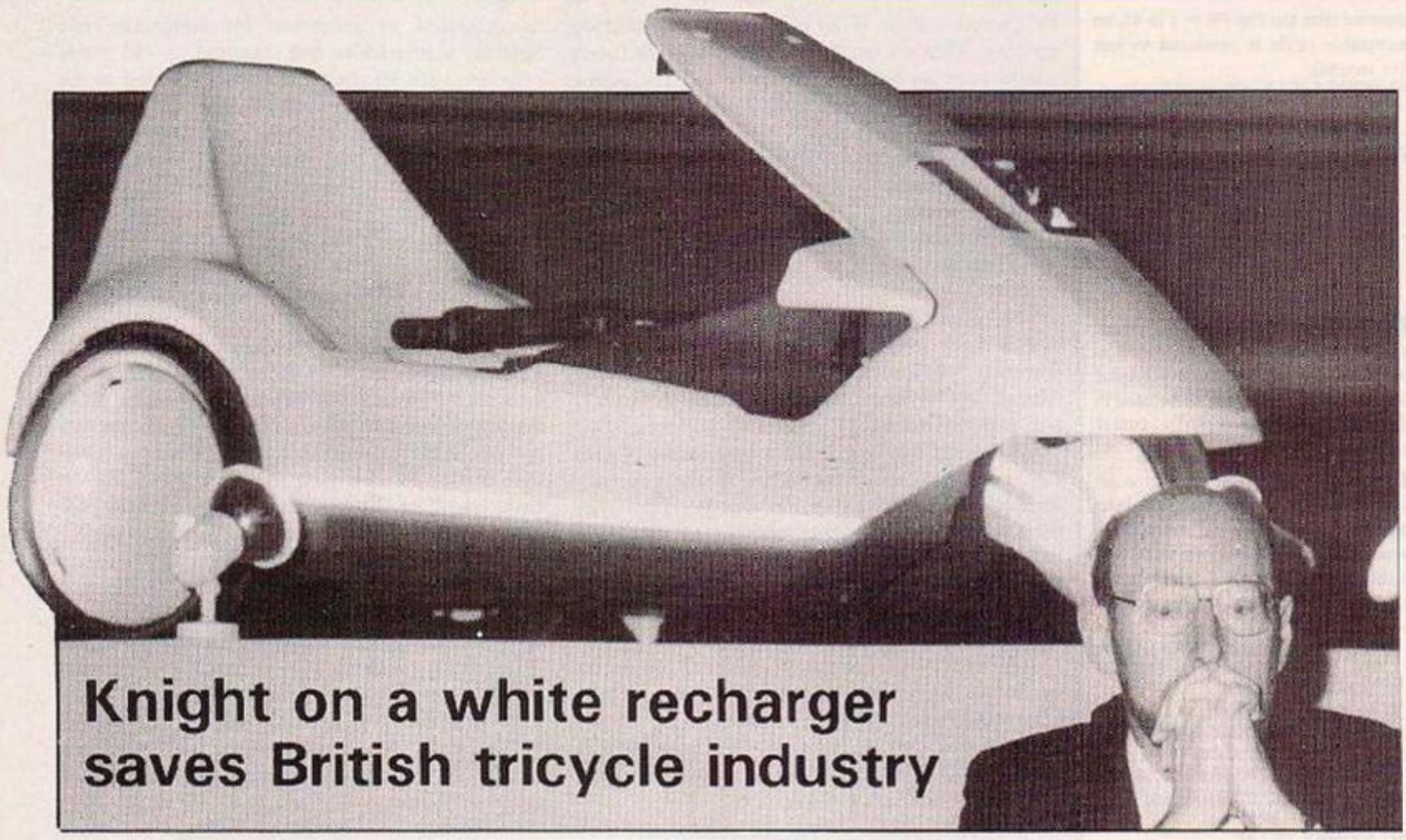
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Knight on a white recharger saves British tricycle industry

SINCLAIR'S ZERO ELECTRIC VEHICLE is more of a toy than the "ideal solution for all types of local journey" which the brochure claims although under current regulations anyone over 14 can drive the C5 electric tricycle on the road without insurance, tax or crash helmet.

The C5 looks a little like a small bobsleigh and going down the snow covered slopes of Alexandra Palace where it was launched it sometimes performed like one. However the 250 Watt electric motor which drives one of the back wheels proved incapable of powering the C5 up even the gentlest slopes wihtout using pedal power. The tricycle soon started making a plaintive "Peep, Peep" noise signalling that the engine had overheated.

On the flat track inside the Alexander Pavilion the C5 showed how much fun a lightweight electric vehicle can be in a controlled environment. The three guiding principles of the Sinclair Vehicle Project as outlined by Managing Director Barry Wills are lightweight materials, good aerodynamics and traditional battery technology with an unconventional approach to design going back to first principles rather than adapting existing vehicles. "We don't take a standard car, van or bus" says Barry "and rip out the engine to replace it with batteries and electric motor."

The C5 is compromised by the need to sneak in under the quaintly named Electrically Assisted Pedal Cycle Regulations 1983. This lays down a maximum power of 250 Watts for the engine which gives the C5 a top speed of 15 mph on the level — less than most cyclists would manage.

With one lead acid battery on board the tricycle has a range of 20 miles before it needs recharging but it can carry a spare battery which doubles its range without exceeding the 60 Kilogram weight layed down in the regulations.

Although the C5 is built by Hoover at Merthyr Tydfil in South Wales Sir Clive cast doubts on rumours that it is powered by a motor that would be more at home in a domestic appliance. He admitted that the company in Italy which builds the engine "does make washing machine motors "but added mysteriously that it "also makes torpedo motors".

Be that as it may a periscope would be handy if you intended driving the C5 on busy roads since your head is only at bonnet level. The steering is controlled by a crossbar under your thighs.

Tramiel stares into infinity as X13 and 5T rangers see the light

TRAMIEL WANTS more blood so the price of the 800XL is to be forced down yet again to £99 as part of a worldwide price war, and meanwhile in Las Vegas Atari's combative chairman showed the new Atari XE and ST ranges, outlined in *Your Computer* January, for the first time.

The XE is what Atari is calling the 8-bit range developed from the 800XL. The standard revamped 800XL will cost $120 in the United States with the 65 XEM music version incorporating a synthesiser at $160 and the 128K 130 XE at $200. The more expensive 65 XEP portable incorporates a 5 inch monochrome screen and 3.5 inch disc drive

What really impressed visitors to the Atari stand at the Las Vegas Consumer Electronics Show was the software demonstrated on the new machines — especially a package called Infinity which incorporates windows, a friendly Help function and integrated spreadsheets, word processor and relational database.

Atari's new QL bashers based on the 68000 will start at $500 with the 130ST which has 128K, mouse, icons and all which begins to sound more like a Macintosh than a Sinclair, and goes up to $300 for the half-megabyte 520ST. Also scheduled are low priced 250K, and 500K drives with a 10 Megabyte hard disc coming too. Atari UK is saying nothing yet about when we can expect to see these machines this side of the Atlantic or what the prices will be.



Personal Assistant is undercover BBC B

ACORN HOPES to have the first of its ABC computers, based on a re engineered BBC-B in the shops by the end of the month.

The Personal Assistant as the bottom of the range model is called will be a packag of a new keyboard containing a slimmed down BBC and built-in View word processor and Viewsheet spreadsheet on rom together with a monochrome screen including a built-in disc dive drive. The price is likely to be less than £1,000.

The reducec chip coun — Electron styl: — will also be used in the BBC which will be able to offer additional features or dramatically drop in price as a result. A tight-lipped Acorn spokesman would only say "that's one of the ways of making it cheaper to produce".

Price cuts for the BBC are coming anyhow after a bad Christmas for Acorn. The company admits that Electron sales were "not in the same league as Commocore or Sinclair."



QL helps out gardeners

PATRICIA AND TOBY Hodd want to turn the Sinclair QL from a home computer into a garden computer.

The Shrub Data Bank and Planner is designed to run alongside the Archive data base and it will then answer questions like "shrub, fragrancy, hardy" to describe what you want then "complete shade, moist" to describe the habitat it will have to survive in. Back will come the following suggestions "Elder, Privet, Skimmia, Winter Jasmine and Wisteria."

The Hodds are keen conservationists — with a history of wild life research in India who now live in Llangeitio Nurseries, Llangeithio, Tregaron, Dyfed, SY25 6QG which is where you should send your £12 if you want a copy of the program on Microdrive cartridges.

Schizoid Commodore shotgun blasts 64, 128 and CP/M targets

THEY CALL it "The Shotgun" — not because of the war with Atari but because the Commodore 128 hits three target audiences simultaneously.

First it is an important new machine in its own right with 128K RAM and yet another new, improved Basic 7.0. Second it can cut itself in half — the sawn-off shotgun — to run all Commodore 64 software — giving it an instant software base — and third it can run CP/M using a Z-80 processor in addition to its 6502 derived 8502 processor.

The 128 costs $250 and was officially launched at the January Consumer Electronics Show in Las Vegas, but with the exchange rate plummetting it is difficult to predict the British price when it arrives in the early summer. Commodore is also launching an IBM PC lookalike which may eventually come down to home computer prices and a portable called the LCD.

Match day for Amstrad

MATCH DAY from Ocean is likely to spread from the Spectrum to the Amstrad. Despite the problems of programming on the Spectrum Jon Ritman and Chris Clarke have produced a game which looks almost as good as International Soccer on the Commodore 64 as well as giving as good a game.

Ocean Producer Jon Woods claims that in some respects notably price — £7.95 it is better. Also "on the Commodore game players can walk through each other, on ours they can't."

Cambridge ain't big enough for both of us

SIR CLIVES much publicised Christmas punch up with Chris Curry of Acorn in the Baron of Beef pub in Cambridge is not the only example of an isolated occurrence in the computer industry.

The two multi-millionaires may have been unlucky to have been caught brawling in public after their respective companies end of year parties but similar feuds have been running elsewhere. According to one bruised Imagine refugee "Cambridge" is more mature and civilised" than most of the rest of the industry.

Up in the wild North-West Freiton which is supposed to be finishing the megagame Bandersnatch — another Imagine refugee — has been harassed by the arrival of a whole stream of unsolicited goods and services including a rubbish skip, 20 fire extinguishers 6 desks and a flood of junk mail.

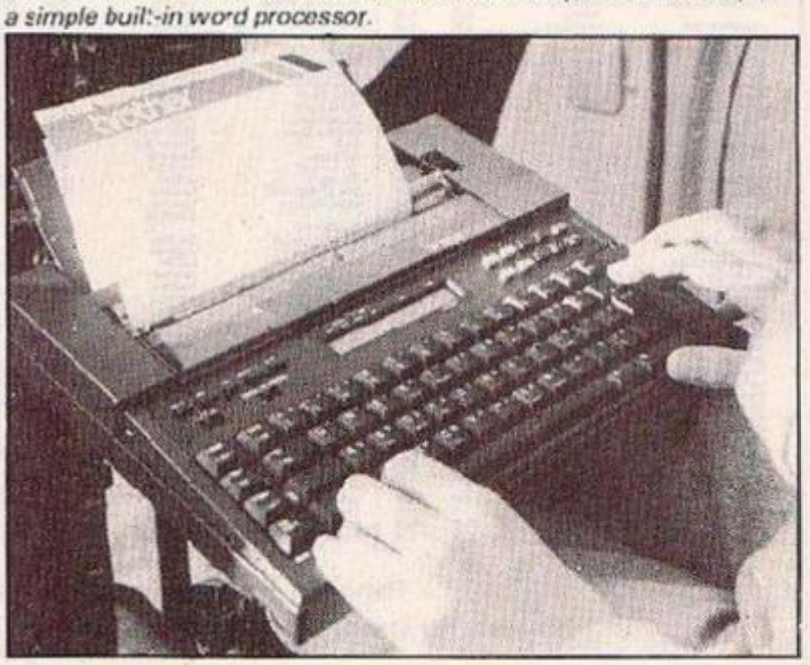
Meanwhile Sinclair is supposed to have "made contact again" with "scum" as he called his ex-employee Chris Curry and the pair are supposed to be the best of friends again. The Fracas happened on the Friday before Christmas when Sir Clive lashed out with a furled copy of a magazine because he was angry about Acorn's "dishonest" advertising.

Traditionally Sinclair customers in a similar situation have just written to the Advertising Standards Authority to complain that the 28 days advertised has not been complied with — let's hope Sinclair has not set a precedent for more direct action by his customers.

YOUR COMPUTER TOP 20

Game	Company	Machine
Airwolf	Elite	Spectrum
Booty	Firebird	Spectrum
Bruce Lee	US Gold	CBM 64
Combat Lynx	Durell	Spectrum
Daley Thompson Decathlon	Ocean	Spectrum
Elite	Acornsoft	BBC
Eureka	Domark	CBM 64
Fall Guy	Elite	Spectrum
Ghost-busters	Activision	CBM 64
Havoc	Dynavision	CBM 64
Hunchback I	Ocean	CBM 64
Knight Lore	Ultimate	Spectrum
Lords of Midnight	Beyond	Spectrum
Pyjamarama	Mikro Gen	Spectrum
Raid Over Moscow	US Gold	Spectrum
Savage Pond	Argus	Electron
Tir Na Nog	Gargoyle	Spectrum
Travel with Trashman	New Generation S/W	BBC
Under-wurlde	Ultimate	Spectrum
Zaxxon	US Gold	CBM 34

Portable and powerful, Brother's TC-600 is the next development from the EP-44 with more communications ability, more memory and a simple built-in word processor.



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BBC B with DFS £469
BBC B with Cornet £446
Electron £169
Electron (with 5 free tapes) £199
Electron (with free cassette recorder + 4 tapes + 'Me and My Micro' book) £225
ZX Spectrum 48K (with free software worth £57) £125
ZX Spectrum Plus 48K (with free software worth £57) £175
Memotech 512 ..... £275
Commodore 64 ..... £189
Apple IIe with 2 disk drives and controller £985
Amstrad (green) CPC464 ..... £239
Amstrad (colour) CPC464 ..... £349
Sinclair QL £399

PRINTERS

Canon PW1080A N.Q. £325
Kaga Taxan EP810 with N.Q. ..... £Ph
Canon PW1156A with N.Q. £425
Canon PJ1080A (colour) £399
Epson P40 ..... £95
Epson new ..... £POA
Epson RX80FT £299
Epson FX80 ..... £369
Epson FX100 ..... £520
Epson DX100 Daisywheel £475
Brother HR15 (Centronics or RS232) £155
Brother HR15 (Centronics or RS232) £445
Brother EP44 ..... £235
Juki 6100 (Centronics £575
Juki Sheet Feeder £248
Daisy Step 2000 ..... £250
Shinwa CP480 (Centronics) £215
Shinwa CP480 (RS232) £230
Commodore 1520 (p £95
Commodore MPS801 ..... £210
Alphacom 32 ..... £80
MCP 40 ..... £120

DISK DRIVES

Sinclair Microdrive £4
Sinclair Interface 1 ..... £4
Sinclair Expansion System (inc. Microdrive+Interface 1 /Tasword Two/Masterfile Ant Attack/Games Designer £9
Commodore 1541 ..... £21
Torch Disk Pack £80
Memotech (Single) £41
Memotech (Dual) £80

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CSX200 200K 80T £15
CSX200D 200K 40T DS £16
CSX400 400K 80T DS £20

Cumana single with PSU)

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CS200D 200K 40T DS £19
CS400 400K 80T DS £20

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CD400D 2x200K 40T DS £36
CD400Q 2x200K 80DT £33
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Microvitec 1451M2 ..... £245
Microvitec 1451 MD £275
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Commodore 1701 ..... £219
Fidelity TV/Monitor £219
Fidelity CM 4 ..... £179
Fidelity GL Monitor £199
Amstrads Modulator £39

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Cambridge Programmable Joystick + Interface + Program £25
Kempston interface £14.50
DK Tronics Programmable £22
DK Tronics Dual Port £12
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First Byte Interface £11
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BBC ROMS & UTILITIES

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Beebug 2 (2 disks) £15
Graphkit (Disk) £8
Quadtask (Disk) £11.50
Beta Base (disk) £25
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Wordwise £40
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Acorn Speech Rom £25
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6502 Second Processor £150
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SOFTWARE

Spectrum 35
Cosmocodes 70
Amstrad 6
Electron 6
BBC 15
Memotech 5
Vic 20 5
Please send for software lists.

PRINTER INTERFACES

Epson RS232 ..... £29
Epson RS232 with 2K buffer £39
QL Electronics £49
Canon RS232 Interface £69
Shinwa RS232 with 2K buffer £69
Juki RS232 ..... £59
Kempston Interface-C £29
Kempston Interface-S £15
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DESKS

Opus Model 1 ..... £180
Opus Model 2 ..... £190
Opus Model 3 ..... £190
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Opus Model 10 ..... £200

AMSTRAD

Title	Company	RRP	Our price
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Eros	Interceptor	5.50	4.95
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Adventure Quest	Level 9	9.99	8.90
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I could do that...

The problem for December's competition was to write a program which played noughts and crosses. Still pursuing the theme of artificial intelligence, we also suggested that you might give the program the capacity to learn from its mistakes.

The winning program — for the BBC — came from S. O'Grady, 29 Linden Gardens, London W2. It does not include a learning facility but then it does not need to — the program never loses. Admittedly, managing to win or draw every time at noughts and crosses is not difficult.



We were impressed, however, by how short the program was. It uses the evaluation function described in David Levy's book, *Computer Gamesmanship*. This involves examining each possible move and counting the number of noughts or crosses in each horizontal, diagonal, and vertical row.

Line 230 then works out a score according to the formula: S = N3*128 − C2*63 + N2*31 − C1*15 + N1*7. N3 contains the number of rows of three noughts, C2 the number of rows of two crosses, and so on. The computer, which is playing noughts, makes the move with the best score.

If you do not have a BBC you should be able to convert the program fairly easily. MCD3 in line 50 gives the remainder when a number has by then divided

(continued on page 29)

High-level languages

LAST MONTH'S First Bytes showed why operating systems are necessary: they handle all the boring housekeeping functions on a micro, and generally keep it ticking over. Thanks to them, the micro is your obedient slave, just waiting for your commands.

But to get your Spectrum or Commodore 64 to leap through hoops you need some way of telling it exactly what to do. This is where high-level languages come in.

They are called high-level because humans can understand them, more or less, and it is a well-known fact that we are higher beings. Low-level languages are things like machine code that only freaks who think in hexadecimal can cope with.

A high-level language is a computer language that uses a series of statements that look a bit like English, and whose rules — the "syntax" of the language — mirror those of everyday speech. In this way the whole business of programming becomes much more straightforward.

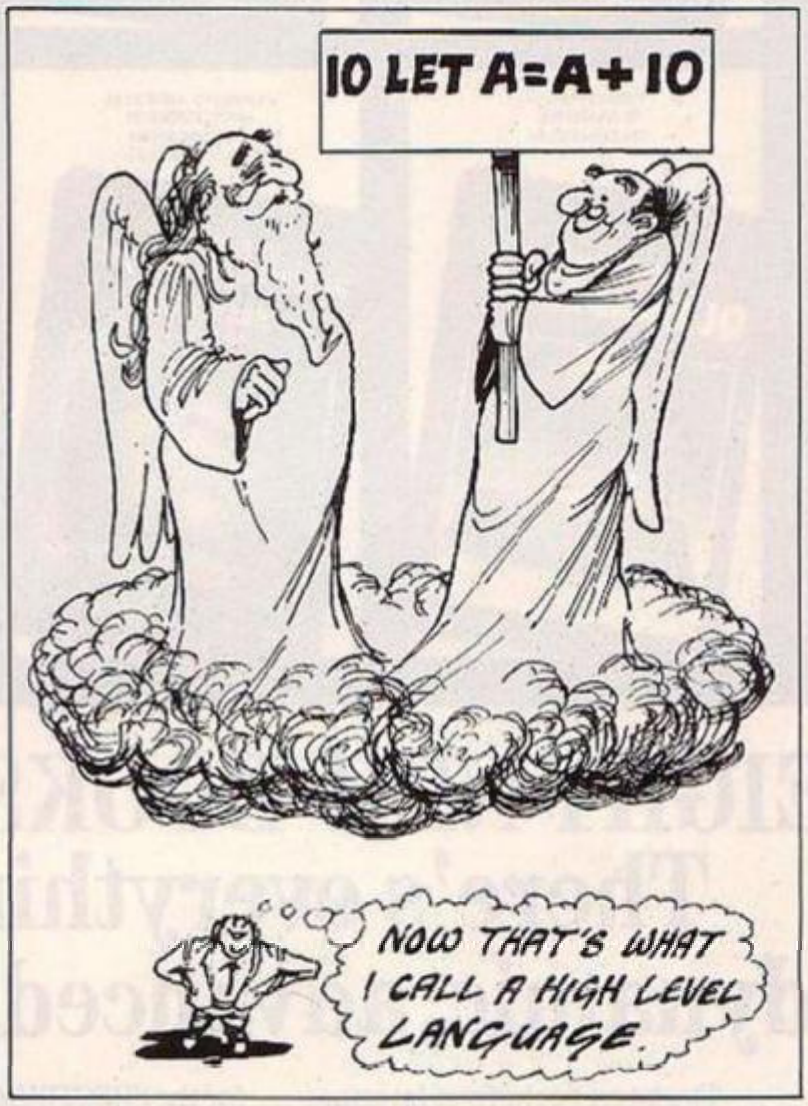
The most famous high-level language is of course Basic. Basic is so common that people tend to forget that it is only one of many ways of talking to your micro. Not only are there numerous other high-level languages, but also a whole range of progressively lower levels you can interact with a machine.

Basic stands for Beginner's All-purpose Symbolic Instruction Code, and was developed 20 years ago with the specific aim of creating a language that was reasonably close to English, and hence could be taught to beginners.

It uses simple words like If, Then, Do, Goto, together with the usual mathematical operators like + and . Each line of the program contains one or more sets of commands written using them. After a program has been written, it is then run.

The idea of running a program is something else we tend to take for granted, but is a key ingredient in developing advanced and powerful software.

Some high level languages, including Basic, allow you to enter a command which is obeyed immediately. This is fine for very simple calculations, but does not let you move on to more complicated problems.



In fact, programming languages do not always have this immediate mode of execution. For example Fortran, short for Formula Translation, can only run complete programs after they have been fully built up. In appearance its programs look very similar to ones written in Basic, which is hardly surprising since Basic was partly based on it.

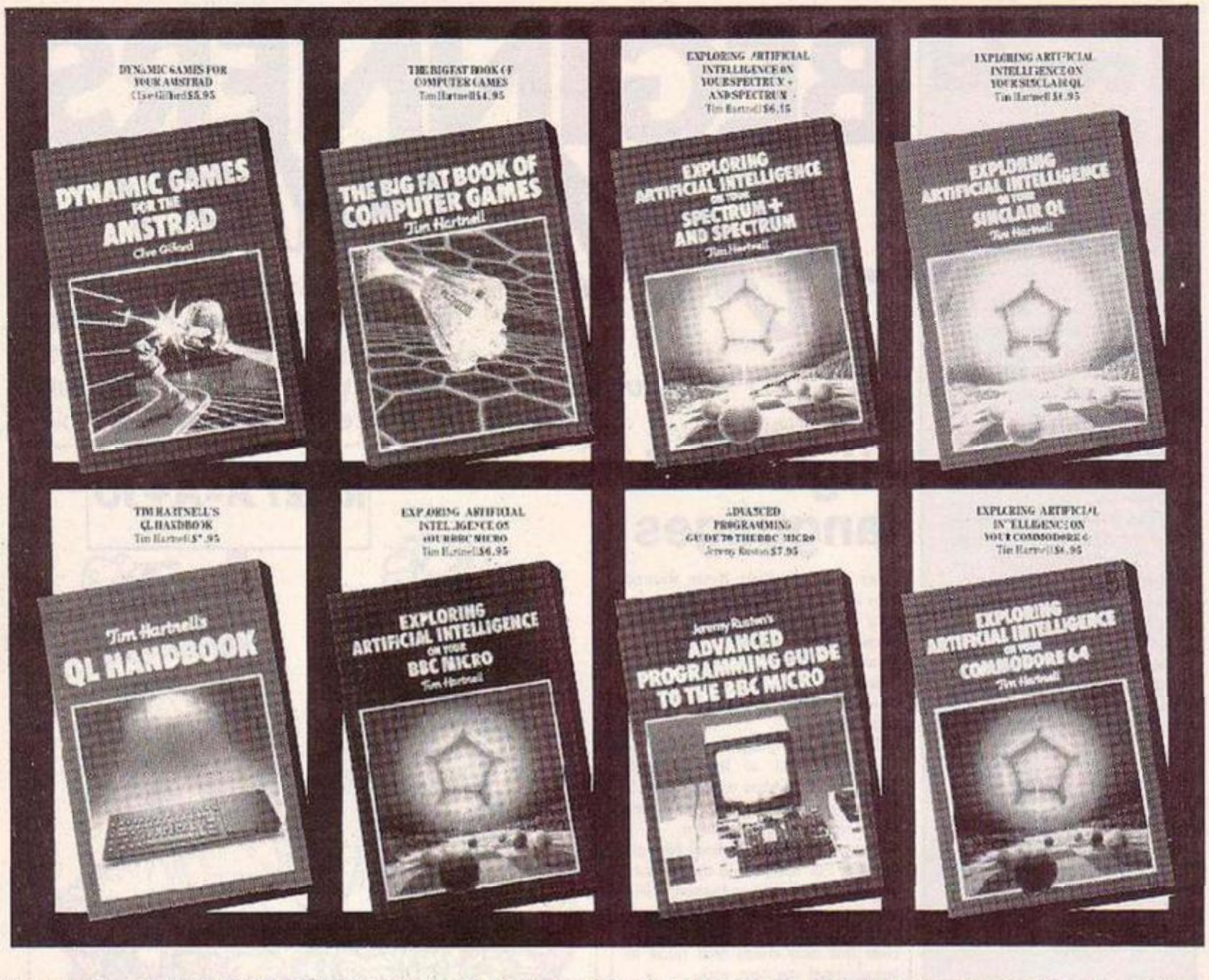
There are minor differences of syntax, but it is easy to move across if you know Basic. Fortran is used mainly for heavy number-crunching applications in science and engineering, and so is not often found on micros.

Another language in the Basic stable is Pascal, named after the French mathematician. It came about from trying to design a high-level language that would have all the advantages of Basic without some of its less desirable features. Advantages included that it was easy to learn and understand. Its less desirable features included the dreaded Basic Spaghetti Syndrome.

Anyone who has written Basic programs knows the temptation. When you find that your program does something unexpected, or has missed out a particular case, or needs modifying, you don't go away and write a whole new program. Instead you add a Goto or two.

This often works very well. Unfortunately it can leave the logic of your program as tangled as a plate of cold spaghetti — hence its name. This means that when you come to look at your program again in a few months' time, you cannot for the life of you work out how it is doing what.

(continued on page 29)



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(continued from page 27)

Pascal aims to stop this sloppy kind of programming. One of its tricks is not to have a Goto at all. Instead you must break up your program into neat and logical smaller units. Pascal is also very strict about saying what kind of variables you are working with — integer, real, and so on — and won't let you pluck them out of the air as in Basic.

All-in-all, Pascal is designed to encourage good clear programming habits in a high-level language. It is becoming available on an increasing number of home micros. So if you feel like a little discipline, it could be for you.

Another language that is beginning to appear is Forth. This was originally designed to control the movements of an astronomical telescope. It is still mainly used today for such control applications, especially things like robot arms.

Like Basic, Forth can respond immediately to a command or to built-up programs. One of its most powerful features is the ability to create new commands in the language as you go along. Whereas in Basic you are stuck with those that the designer thought fit to stick in, in Forth you use the fundamental commands to write new ones for your particular needs.

One slight disadvantage with the language is the way in which you write out mathematical operations. Because it was developed for specialist applications, the designer didn't worry too much about little oddities. One of these is the fact that you use what is called Reverse Polish Notation.

Effectively this means that all the numbers and functions are bunched together at one end of the line, and all the operators that act on them at the other. The way they interact together requires a certain amount of mental acrobatics.

If you wish to retain the ability to create your own functions and operators without having to sacrifice all the legibility of Basic, you could try something called APL.

This stands for simply A Programming Language. Like Fortran it has a strong mathematical bias to it, and it is very useful for writing one-line programs that carry out complex calculations very quickly.

One problem with most versions of APL is that they use a large set of extra signs that make an APL program look like Ancient Egyptian hieroglyphics. This also means that you really need a special keyboard too. Which is a bit of a joke when you consider that some micros like the Spectrum haven't even got an ordinary keyboard.

Happily a version has recently been launched for the QL that replaces all these symbols by simple words. The combination of the QL and APL creates one of the most powerful micro number engines around.

All the languages so far considered have been geared towards the processing of numbers. But another class of high-level languages is concerned with lists and rules.

These are languages that are beginning to produce significant progress in the trendy field of Artificial Intelligence. One that is available on several home micros is Lisp.

Its name comes from LISt Processing. It works by manipulating lists of things rather than simple numbers. Used properly, it can make deductions from associated lists of information. Another language that is used in this field is Prolog — Programming in Logic. A version called MicroProlog is just starting to come through, and offers the same possibilities of trying out programming in AI.

There are many other high-level languages in use today, and they are still being written. As home micros get more powerful and with bigger memories, so the range of options increases. Memory is an important factor because a language is just like any other program in that it needs space to store it in order to run it. For this reason many home computers put their Basics on a Rom chip. This saves valuable space, and allows the language to be used with the full Ram of the machine.

BEGINNERS first bytes

I could do that...

(continued from page 27)

by three; while DIV3 returns the number of times three divides into another number. X = 8 MCD3 could, for example, be replaced by X = 8 – 3*(INT(8/3). You may also need to replace the Proc statements by Gosubs.

For this month's competition the £15 prize will be awarded to the program with the most interesting bug or bugs. Quality is more important than quantity here: we are looking for those maddeningly elusive bugs that keep you up half the night. The program should not be more than 20 statements long, and should be accompanied by a note telling us what it is supposed to do.

Micros that can talk

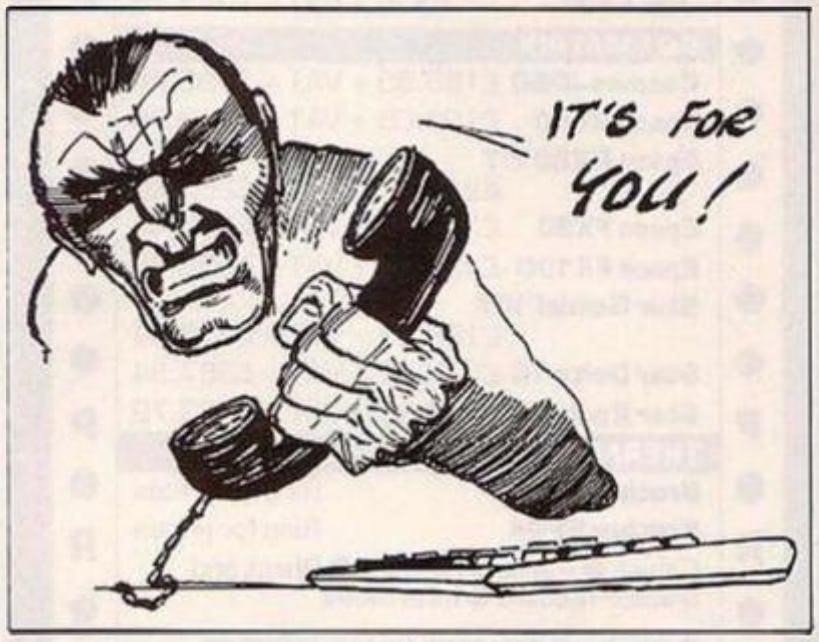
MICROS ARE pretty wonderful beasts, but they can be rather anti-social. After all, spending hours beat over a hot keyboard as your eyes go square from staring at the TV is hardly the best way of communicating with your fellow men and women. Yet potentially the micro could be the cause of a communication revolution.

Anyone who has used a mainframe computer at a university or in a big firm knows that much time is spent passing messages from terminal to terminal. Now wouldn't it be great if you could do that with your micros? All you need is a bit of wire to connect you up, except that really you would need bits of wire from you to everybody, and so would they.

Rather conveniently, this network of wires up and down the land already exists. It is called the telephone. All you have to do is to find some way of getting your computer to talk down it. The device used to do this is called a modem.

An obvious way is to convert the signals inside a micro into some kind of audible sound. The telephone can then carry this in the normal way. A modem incorporating something called an acoustic coupler is used for this purpose.

This translates the 0s and 1s that go to make up a computer program into two distinct frequencies. In this respect it is like Basicode described in October's First Bytes. These are then fed down an ordinary telephone headset by plugging it into special rubber sockets on the acoustic coupler. A similar acoustic coupler is used the other end to decode these two tones back into the machine readable binary digits.



Although simple in theory and fine in principle, there are one or two very obvious difficulties with this method. First, if the headset is disturbed while data is being sent there is very likely to be corruption of the audio bleeps and hence the information sent. Secondly, the whole system of using very fast changes of frequency — about 300 per second — is fraught with similar dangers.

Far safer is the direct connection modem. This allows you to plug your micro directly into the telephone system. After the modem has done some discreet preparation of programs to be sent, they can then be downloaded directly. This is both less likely to suffer from data corruption and potentially much faster.

There is the slight problem that British Telecom is understandably concerned about what you might shove down its precious telephone lines in this way. Direct connection modems are therefore subject to pretty exhaustive scrutiny by the British Approvals Board for Telecommunications.

It is illegal to connect a modem to the network that has not been approved. Approved models carry a round green sticker; models that are not approved must say so by carrying a triangular red sticker.

Naturally, approved modems cost more — the cheapest is about £100 against £50 for an unapproved model. But do not be tempted to cut corners. BT periodically tests telephone lines.

Besides, there is no real point. A few years ago, a modem would have cost several hundred pounds at the cheapest. Today, the £100 barrier is being breached all the time for most popular home micro models, and prices are still dropping. You can even get autodial models for this sort of price. These are rather civilised devices that will even dial the number for you.

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USING used with PRINT
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FUNCTIONS

AND (bit-by-bit)
BIN# decimal to binary
CHAR$ number to 2 characters
CODE first code
DEC hexadecimal to decimal
DPEEK double PEEK
HEX$ decimal to hexadecimal
INSTRING string search
MEM free memory
MEMORY$ all of memory as a string
MOD modulus
NUMBER 2 characters to number
OR (bit-by-bit)
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SINE fast sine
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TIME$ current time
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Local news

Irvine

You can make contact with the Irvine hackers via Ewan Dalton, 21 Berry Drive, Irvine, Ayrshire KA12 0LG or telephone 0294 7657. Membership costs £2

Whitehaven

The West Cumbria User Group serves the Whitehaven and Workington area. Activities include open evenings, computer courses and working on various projects — including speech synthesis, digitising graphics and a lightpen. Ring P Majid on 0946-62732 or K Purkiss on 0946 66586.

Gravesend

The Gravesend Computer Club now hangs out at the Council Tenants Club, Whitehill Lane, Gravesend, Kent. They meet every Thursday evening. Contact The Club Secretary, 58 Apsledene, Hever Farm Estate, Singlewell, Gravesend, Kent DA12 5EE.

Colwyn

Colwyn Computer Club meets at the Greens Hotel, Colwyn Bay. Contact D Eevan, c/o Abergele Road, Colwyn Bay, Clwyd LL29 7PA.

COMPUTER club

Paul Bond takes a trip to the banks of the Thames to discover what the besieged GLC is doing micro-wise.

TO BE OR NOT to be? Shakespeare may not have had the Greater London Council in mind when he penned these immortal words — but there is inevitably an element of doubt whenever one writes about a body linked with the GLC, subject as it is to such a withering onslaught from the central government.

David Kimpton put it this way with regard to the GLC Computer Workshop, of which he is head: "No-one has tried to identify functions which should not continue". The functions are certainly many and varied. The famous Room 97 — it is now just called the Computer Workshop — provides a chance for people to try out various types of personal computer. It is occasionally booked by London-based computer clubs like the Association of London Computer Clubs, BASUG, and the Independent Commodore Products User Group (ICPUG) — but it also provides seminars and workshops for voluntary organisations, community groups, trades unions, co-operatives and professional associations.

The premises opened in February 1982, and Mr Kimpton's job was originally to look after information technology (IT — remember that?) and the GLC. They kicked off by sending out a survey via the London Voluntary Service Council which has a list of the 5,500 voluntary organisations in the capital. Since then they have built up equipment, expertise and increased staff resources to 10.

Organisations which have received help include Age Concern Greater London, British Sports Association for the Disabled, the National Jazz Centre, the London Union of Youth Clubs, and various Family Service Units. In the last six months they have held 98 seminars, advised over 100 individuals and dealt with over 200 delegates from disabled organisations. These include co-operatives like the Collective Design and Building Co-operative and the Half Moon Theatre.

Systems advised on include everything from dBase II on a Televideo — as used by the Mental Health Foundation to build up a directory of caring agencies — down to the less recherché BBC Micro used by FLAT (Facility for Living & Assessment Together). FLAT is a small registered charity set up to provide training in self-help skills for mentally handicapped people in the London Borough of Southwark. The BBC is used as an administrative tool for budgeting and cash-flow analysis, and providing training sheets — each FLAT trainee has a planned training schedule — and mail. It is envisaged that the computer will eventually become a training aid using basic educational games. A BBC with a database Rom is also being used by Unity 70, an organisation for handicapped children.

The GLC Computer Workshop doesn't just provide help for caring agencies — for example, some advice has been given to Fantasy Factory Video, a non-profit making organisation which is compiling a database list of all existing commercial and educational videotapes. The Workshop also maintains contact with groups like Microsister and Central London Women & Computing which provide resources for women using computers. The latter organisation can be contacted on 01-430 0112.

During the summer the Workshop developed a Braille word processor at considerably less cost than the £5,000 that existing specialised systems can cost. This was done by the simple expedient of placing a high-quality racing bicycle inner tube over the printer roller. Braille is all based on six dots arranged in pairs like the six on a dice-face. These are printed out by the full stop.

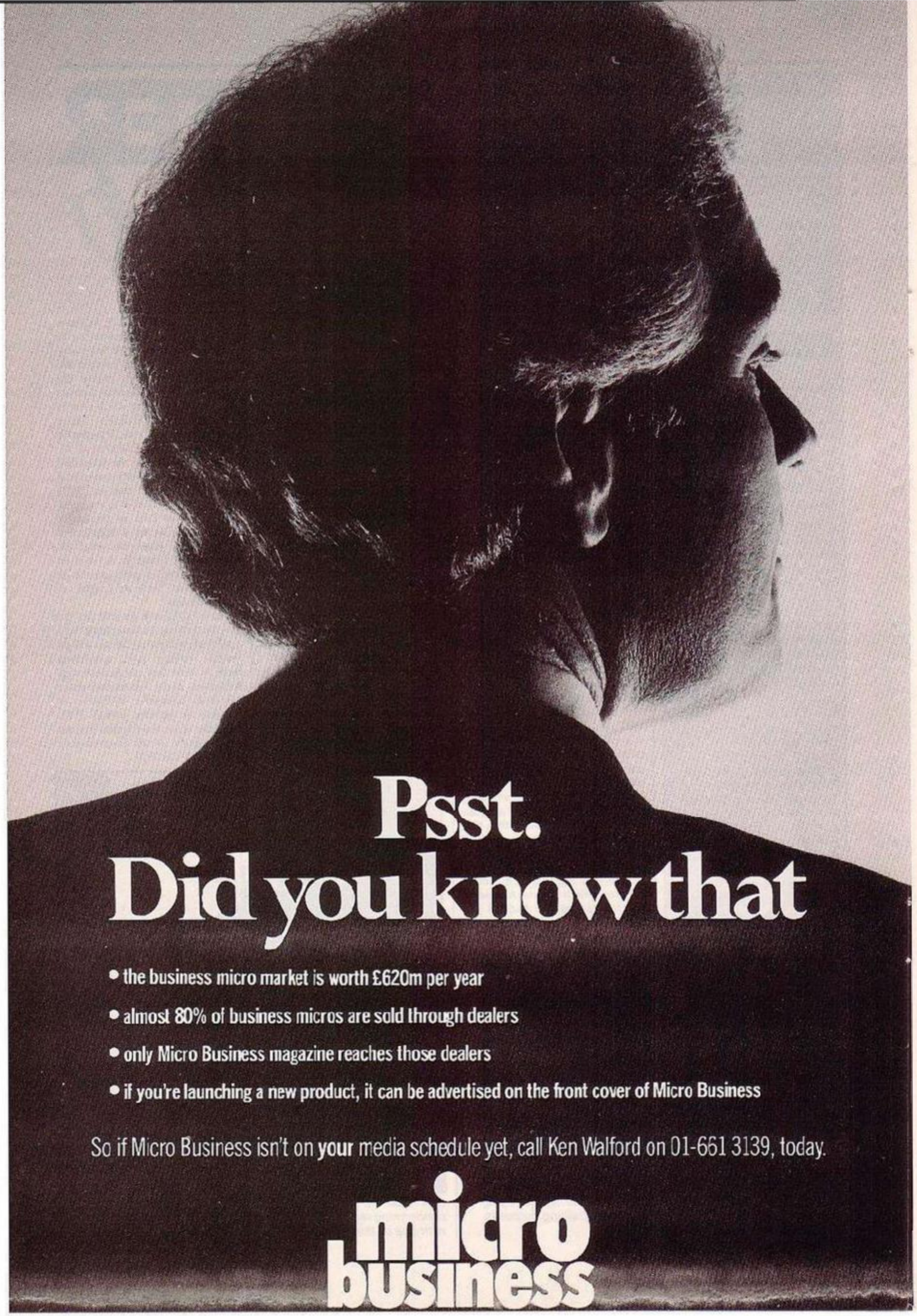
The GLC has put £30,000 into the London Festival of Computing held April 9-21, and hopes that this will go towards making more Londoners aware of what they can achieve with computers. More information about the GLC Computer Workshop is available by phoning 01-633 3592. Enquiries about the London Festival of Computing should be directed to BIPR on 01 734 2937.



Central London Women & Computing's Rachel Sarger using one of the six Apricots that CLWC have for training purposes. They are funded by the GLC.



Last year the GLC ran a competition for a computer game condemning racism. Here Ken Livingstone is seen zapping away with one of the winners.


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HARDWARE

ADD-ON EXTRA

Opus

Disc System
Spectrum
£199.95

Opus have released a disc system for the Spectrum which they claim is totally compatible with the Microdrive operating system. This means that any program which runs on a Microdrive will run on an Opus system, at a much higher speed. The Spectrum sits on top of the metal interface and can be screwed into it, like Interface 1.

Apart from the Shugart disc socket there is a bi-directional centronics type printer port and a continuation of the expansion bus. The full range of Opus drives, three or 5¼ inch can be used. The system comes with a utility disc and a manual.

The manual is perhaps its only major failure as it rather assumes you know how to use a Microdrive. Still, you can always buy one of the many "drive your Microdrive" books. It represents excellent value at £199.95 for the complete system and is available from Opus on 01-701 8668 or from larger branches of Boots

Euromax

Joystick Interface
+4 and C16
£4.45

This is a useful add-on for C16 and +4 owners, giving them access to the huge range of Atari-type joysticks available. This includes Euromax's own range.

Interpress

Cassette Storage
£6.00

The Boneco Audio Cassette Safe can store up to 10 cassettes in a sliding draw. Several draws can be clipped together. The cassettes are stored vertically.

Euroelectronics

Printer Interface
Spectrum
£34.95 + cable

For those lucky enough to have one of the new colour printers, this interface allows full colour or four colour screen dumps.

AMX mouse

BBC
Advanced Memory Systems
£89.95

BY INTRODUCING paste-over windows, icons and, most importantly, a mouse, Apple's Macintosh almost allows you to bypass the keyboard as a means of operating the computer. When it appeared people predicted that it would only be a matter of time before the same features appeared on an 8-bit micro. Island Logic kicked off by using windows and icons in its excellent music program. And now Advanced Memory Systems has gone one better by adding a mouse to the BBC.

A sensitive joystick

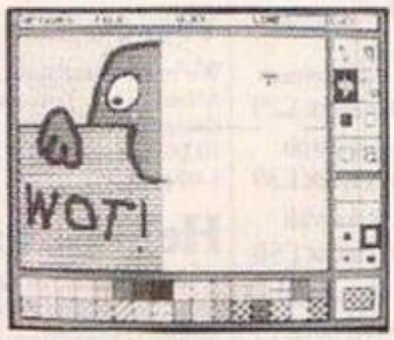
On its own the mouse is not much more than a very sensitive joystick or an upside down trackball, scaled down to fit snugly into the palm of the hand. It connects into the user port and needs a flat surface on which to roll around. What gives it its power is the accompanying software

The AMX mouse comes with a Rom and several programs on cassette or disc. The Rom provides 15 commands which can be included in Basic or Assembly language programs. Together they allow you to use the mouse to control pointers, windows and icons.

Icons are built in

Sixty four predefined icons, each made up of four characters, are built into the Rom. *Icon places the icon of your choice where you want it on the screen. Alternatively you can assign a particular icon to act as the mouse pointer. Then with the command *Movepointer you can use the mouse to move the icon around.

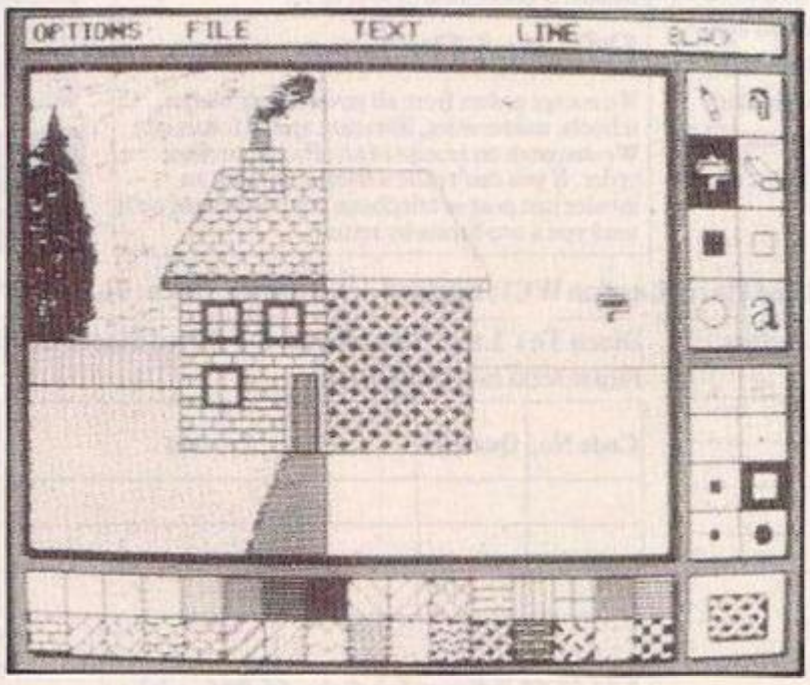
Among the other commands are *Window which draws a window with a border and *Button which defines the key codes generated by the three buttons at the front of the mouse. As the commands are only available in the BBC's high-res monochrome modes, 0 and 4, *Desk is handy since it clears the screen with a grey pattern of alternate white and black dots.



Just how effectively these routines work with the mouse is well demonstrated by the ArtworkX program. It is clearly modelled on the Apple's Macdraw program. Although it is not as powerful it must be one of the most impressive drawing programs yet to appear on a home micro.

To start off you are presented with a blank screen bordered by a number of boxes which show the options available. Eight icons at the right represent such facilities as a spray can, a pencil, a rubber, and a paint roller. If you want to use the spray can, you move the mouse pointer over the icon and highlight it by pressing a button.

Now you can choose a spray size and, from a range of 24 patterns, a spray texture or "colour". The mouse pointer changes into a spray can and by simply rolling the mouse around your desk top you can create the sort of effect favoured by subway graffiti artists.



A window pops up

When you highlight one of the headings along the top a window pops up giving a further range of options such as dumping the screen to a printer or including text in the picture. The mouse makes all these facilities exceptionally easy to use.

A standard reproach levelled against drawing programs is that they do not improve on pencil and paper. ArtworkX — in conjunction with the mouse — is one program that refutes this charge. Indeed this reviewer was hampered by requests to play with it from people who normally give computers a wide berth.

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SOFTWARE Shortlist

Star chart

Blue Max

CBM-64
£8.95
Shoot-'em-up
U.S. Gold

★ ★ ★

Blue Max flies again — but this time with Commocore markings. With its impressive graphics, this U.S. import first appeared in Britain for the Atari some 14 months ago. The screen display and sound are not as good as the Atari's.

You have to strafe and bomb ground targets — bridges, factories, boats, and artillery batteries — and shoot down enemy aircraft.

Although the setting is World War I, you are flying for the RAF at a time when only the RFC existed and are pitted against the Axis powers of the 1930s.

Yet those academic objections don't detract from what is a very good game.

New Cylon Attack

Spectrum 48K
£5.75
Shoot-'em-up
A'n'F Software

★ ★

In isometric perspective — 3-D to you, mate. This is what it says on the inlay, but I'm not convinced. No swopping through cosmos like Codename MAT.

You just stooge about left and right, up and down, peppering the oncoming hordes with laser bolts. Not very colourful, not very 3-D.

Zone 00

Spectrum 48K
Blow-'em-up
Allanson

★ ★

One of these games where you have to dodge around planting one bomb at a time to destroy your assailants. These include octopi chasing you round shipwrecks that look like Blue Peter badges, and later on yellow submarines and blue meanies.

QL Chess

- *Sinclair QL*
- *Psion/Sinclair*
- *Board game*
- *£19.95*

★ ★ ★ ★ ★

AS KARPOV AND Kasparov, toe to toe under a chessboard, were still slogging it out in what was to become the longest-ever world championship match, Psion was preparing its world-beating chess program for the commercial arena.

Although the Psion program was running on a 8MHz Sage computer when it tied for first place in the 1984 World Microcomputer Championship, its performance on the QL is still very impressive. Its strengths lie a lot deeper than the novelty of the program's three-dimensional graphics.

You should be able to find a level of play from one of 14 that will give you a good game. Those 14 levels can be doubled to 28 with the use of the Easy command — which puts the QL at the disadvantage of not being able to think about its move while you are thinking about yours.

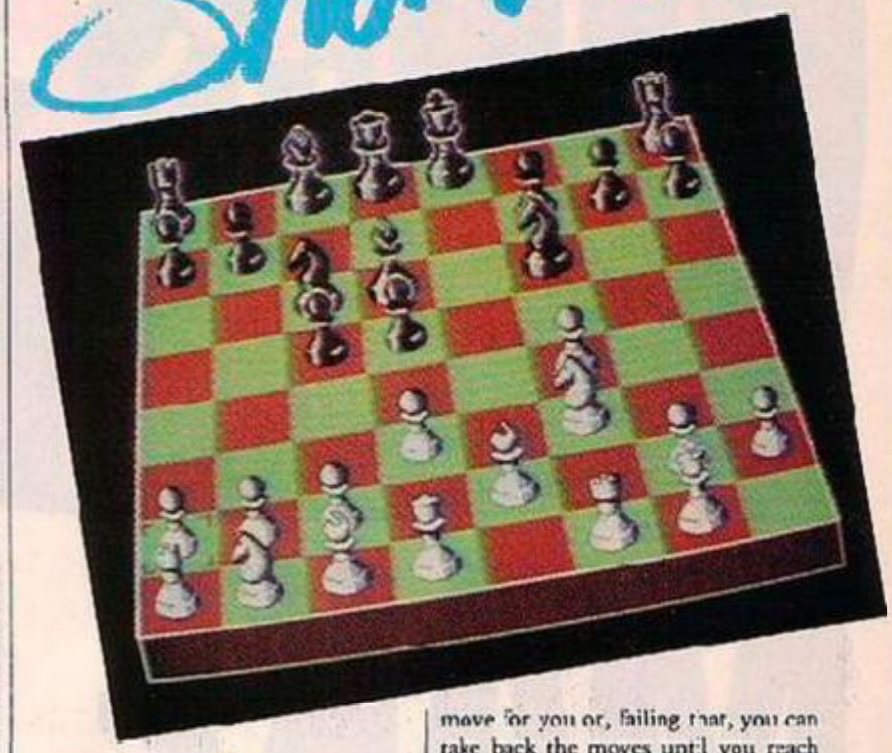
If you really want an easy game, try the novice level 0. The computer will benignly play weakly whenever it looks like beating you. Of course that kind of help may not appeal, so the human can choose a response time from the QL, which can vary from a few seconds at the lower levels up to level 12's equal time — it averages out the time you are taking to move and then matches your pace.

For a game of correspondence chess length, level 13 gives the computer an infinite time to consider its move, and will only make up its mind when you force it to using the M, move now, key. Fans of chess puzzles will savour the Psion program's problem solving ability. It has eight levels.

When things are getting desperate you can ask the computer to suggest a move for you or, failing that, you can take back the moves until you reach the point where you blundered. If you actually manage to inflict a defeat on the silicon opposition you can call round friends and neighbours and bore them with a full-length action replay of your triumph.

But apart from playing a quality of chess never before seen on a home computer, what makes this program immediately attractive is the astonishingly high quality of its graphics.

Toby Wolpe



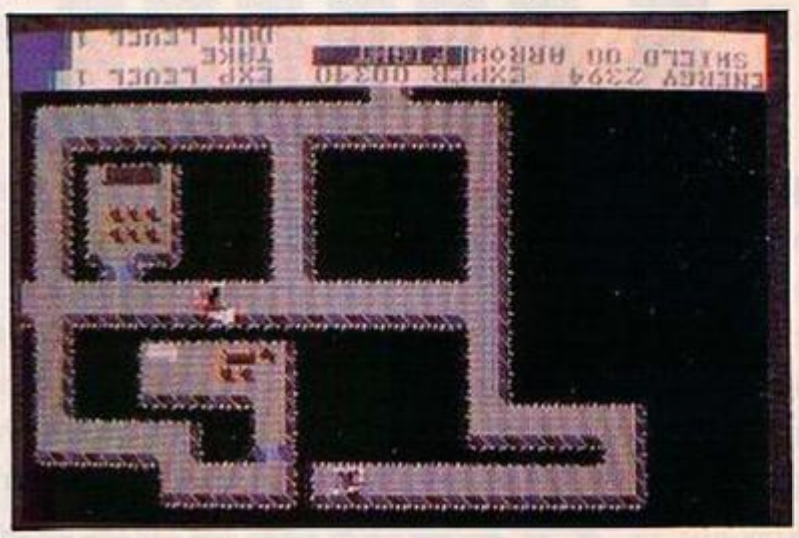
Dungeons of Ba

- *CBM-64*
- *Arcade adventure*
- *Quicksilva*
- *£12.95*

★ ★ ★

RECOVER THE FABLED stone of Ba before your energy runs out. This is a maze game with a difference. Norman the warrior has to fight his way through tunnels, pressing secret panels in the corridors to reveal hidden chambers with objects to help him in his quest. This is an arcade adventure which gives you the kind of section through the earth view of the action best exemplified by Dig-Dug — except that there is no digging.

I wouldn't go so far as to describe the graphics as spectacular — this is how they are described on the packaging — but nevertheless you are confronted with a fair range of weird and wonderful opponents from scorpions to assorted bovver boys, presumably the Guardians of the Stone. You can steer yourself around the maze with the aid of a joystick plus the function keys have been redesignated so that you can put up a shield, or fire an arrow, fight, or take an object. You simply punch the appropriate key before you squeeze the fire-button.

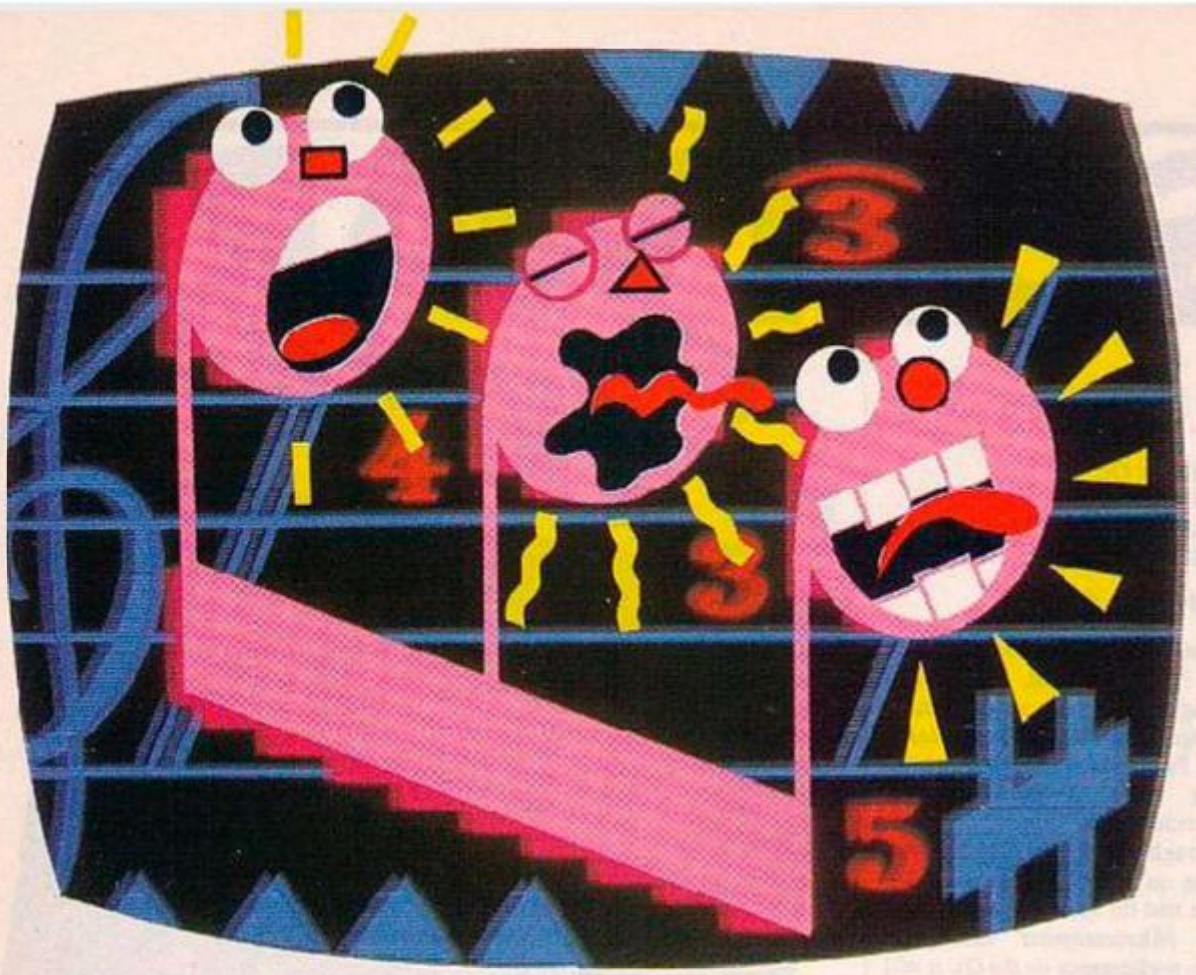


Shields are necessary because arrows will suddenly zoom down the corridors at Norman, though they don't seem to be much use against the denizens of the maze. If you do enter into fisticuffs with any of these beings the C-64 emits a realistic thumping and whimpering sound. With each contact your experience rating increases and your energy level drops.

You can pick up things in the most unexpected places. It is worth searching the apparently empty rooms which sometimes appear at adjuncts to the maze because you may discover food and drink, more arrows, or even a vial of unknown. This can make you zip around the maze at terrific speeds, or not do very much for you at all.

There are unexpected pitfalls and teleport traps which cause you to be pitched in with the most unpleasant company, the usual thumping and squealing resulting. All this kind of

(continued on page 37)



MAKE MUSIC YOUR FORTE.

Alright, let's al gather round the computer for a good old sing-song.

You'll find the new Commodore 64 Music Maker strikes exactly the right note, whether you're an accomplished musician or whether you are an out-and-out beginner.

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That is, make a note slide up in pitch.

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Music Maker has been designed, like all our software, to get the very best out of Commodore hardware.

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commodore COMPUTER SOFTWARE



MUSIC MAKER DISK OR CASSETTE £29.95.

Star chart

Cliff Hanger

CBM-64
£7.95
Novelty
New Generation Software

★ ★ ★

Fans of the Road Runner and the unfortunate wolf who tries to ensnare him using wacky devices in those old Warner Brothers cartoons will love this.

You take the part of Cliff Hanger, an inept cowboy trying to stop a desperado by dropping boulders on him, bouncing weights off trampolines, using magnets to pull anvils over cliff edges and so on.

Crude but attractive graphics, great fun.

Paddington's Garden Game

CBM-64
Collinsoft

★ ★

Butterfly collecting Paddington the Bear has to zip around his garden collecting butterflies without being electrocuted by the hedgerow or stung by bees or pricked by hedgehogs.

Like the Magic Roundabout game, this does not really make the best use of its famous character. The somnolent music would make this a good game to play last thing at night as you wind down from a winter's evening zapping over the hostile alien landscape etc.

ATC

Spectrum 48K
£7.95
Simulation
Hewson Consultants

★ ★ ★

Two games for the price of one, though people who bought the previous version of Air Traffic Control are unlikely to rush out and buy this one just for the extra thrill of controlling Schiphol as well as London-Heathrow. It features Concorde and the occasional radio failure and rogue aircraft.

(continued from page 35)

thing results in loss of energy and eventually in your demise. Certainly a competent and enjoyable game, more up to the standard expected of Quicksilva than some other recent releases from that stable.

Paul Bond.

SOFTWARE Shortlist

Tir Na Nog

- *Spectrum 48K*
- *Arcade adventure*
- *Gargoyle Games*
- *£9.95*

★ ★ ★ ★

SOME OLD HIPPIES might try and persuade you that Tir Na Nog is an Irish folkband that gained prominence along with Planxty and other unpronounceable names. These people will of course know that the phrase is Gaelic for land of youth. So here we have it, a computer game set in the Celtic Other World. There probably are Irish computer jokes but naturally you won't find any of that sort of thing in *Your Computer*.

Based on the great Irish mythological hero Cuchulainn, the game is billed as a "computer movie". Things being what they are today, it is very difficult for a self-respecting computer game to get into the shops without (a) being based on a movie, or (b) going the whole hog and actually pretending to be a movie in its own right.

Tir Na Nog has taken the latter course — the action is presented as though a camera is pointing at Cuchulainn, whom we are assured was known as Cucuc to his friends and intimates. Personally, I would not try calling the shambling knee-jerker at the centre of the screen anything other than Sir unless I had bought him at least three pints of Guinness. If he could play the bass guitar, he would certainly give Motorhead's Lemmy a lot to worry about.

He stands 56 pixels tall — that's pixels, not pixies — and is controlled from the keyboard. The animation of the character is very impressive.

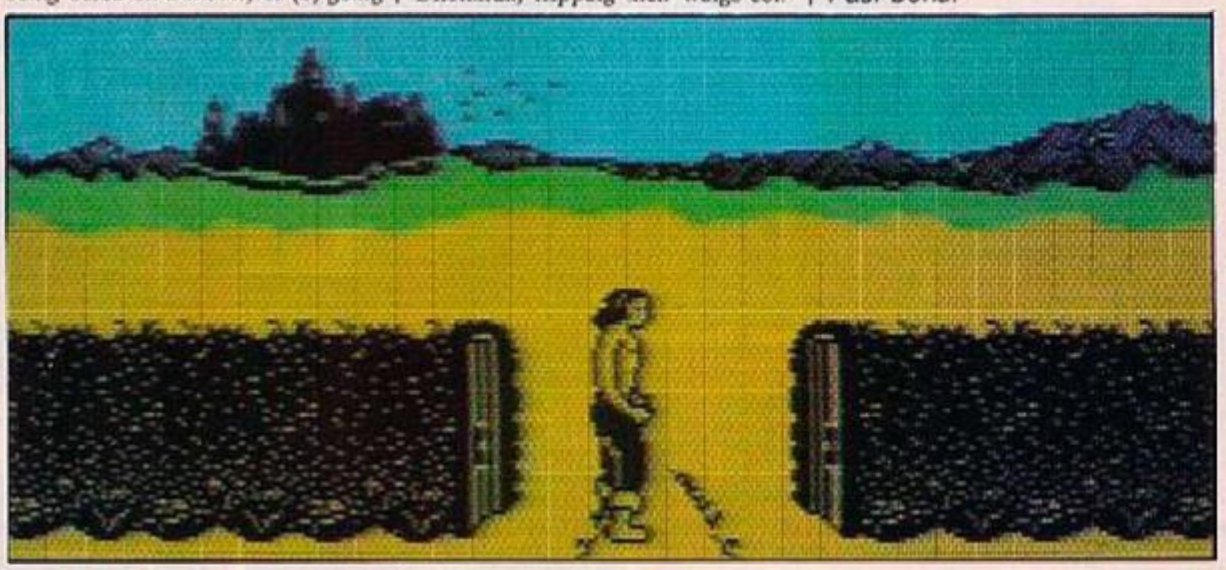
As he slouches disconsolately through Tir Na Nog, the detailed scenery in the fore and middle grounds scrolls past him. Birds of ill-omen hover around the castle of King Dhomnuil, flapping their wings continuously in the distance. Cuchulainn can carry up to four objects — though you have to check with the status area at the bottom of the screen to see what he is actually carrying.

Since everyone in the Celtic Other World is actually dead all you can hope to do is daunt them a little bit, and should anyone harm Cuchulainn seriously he just rematerialises at the entrance to Tir Na Nog — sans objects.

The purpose of the game is to locate and re-unite the fragments of the seal of Calum. Due to a breakdown in security, the seal was smashed into four bits by a servant of the Great Enemy, which has made life very difficult for everybody, the Great Enemy now being free to carry on business as usual, snuffing out galaxies, visiting pain and misery on mankind in the customary way.

Having located the pieces you have to persuade the owners to give them up.

Paul Bond.



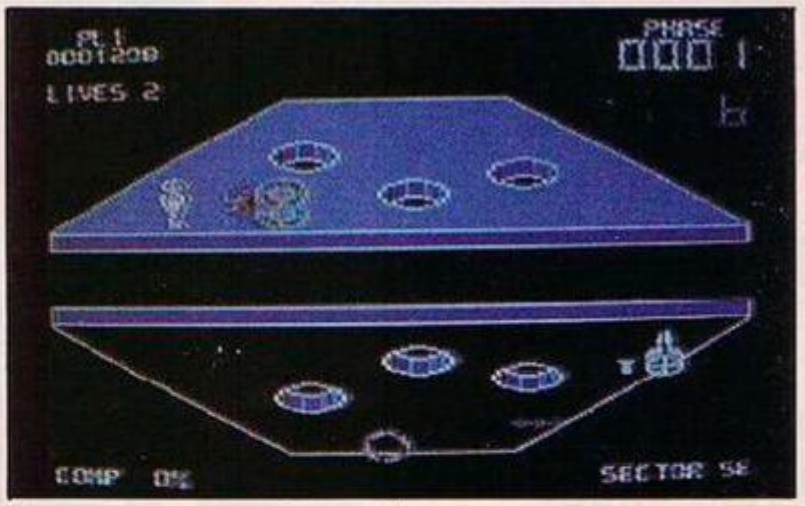
CAD/CAM Warrior

- *CBM-64*
- *Tasksel*
- *Shoot-'em-up*
- *£9.95*

★ ★

NOT A UTILITY program for computer-aided design/manufacture, but a shoot-'em-up. Perhaps with the role-merging of computer games that has led to such strange offspring as the arcade adventure and the arcade strategy game, we are now seeing the emergence of the arcade utility? Maybe future vidkids zapping away in the arcade will unwittingly be designing more efficient speedboats, aeroplanes or three-wheeled electric cars?

The screen presents you with two sides of a metal plate: the top and the bottom. There are some holes bored in it. You steer a robot around shooting at hostile objects. If he passes over a hole, he flips through to the other side of the plate and carries on doing much the same thing, only upside down. As the game progresses, you are presented with different configurations of plate and more hostiles.



The rather confused introductory pamphlet to the game warns us that as more and more of our environment is planned and constructed by machines, it will fall to the machines to interpret the rules by which we want to live.

Life is definitely out of balance in this scenario. The AI-12 is a machine for generating structures in exhibition halls. It is malfunctioning. Luckily

(continued on page 39)

YOU MARVELLED AT BEACH-HEAD...

NOW ACCESS PRESENT THEIR LATEST MASTERPIECE:

RAID OVER MOSCOW

commodore 64







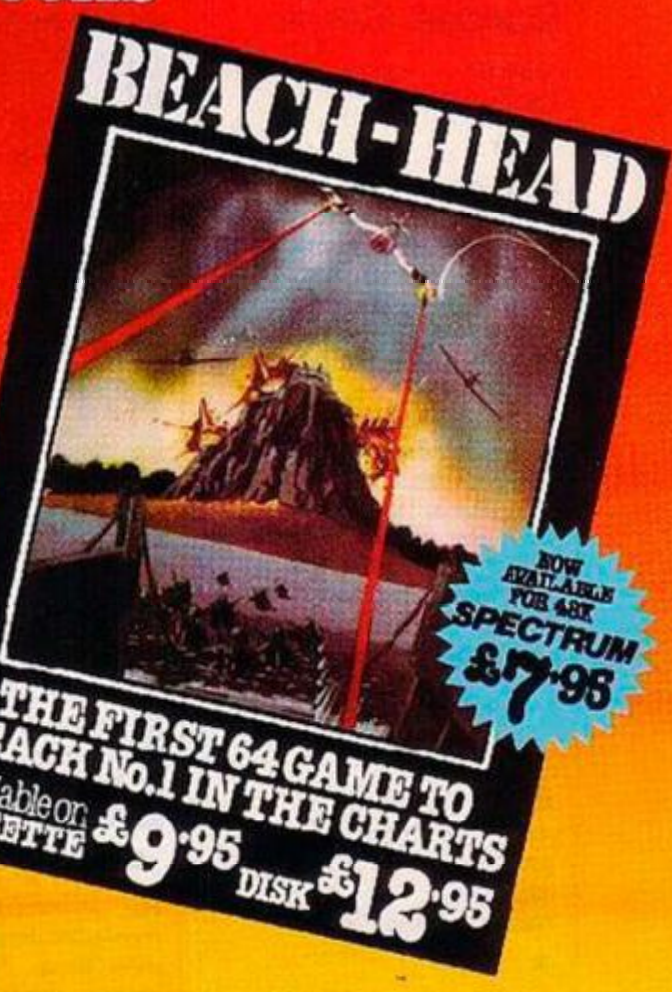
The Soviets launch a nuclear strike against major cities in the United States and Canada. With our own nuclear arsenal dismantled, in accordance with the Salt IV Arms Agreement, the Soviets believe their treachery will lead to total world domination. Our only hope is our space station equipped with stealth bombers, which can fly undetected in Soviet airspace.

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SOFTWARE Shortlist

Star chart

David's Midnight Magic

Commodore 64
£9.95
Arcade
Ariolasoft

★ ★ ★ ★

This old Brocerbund original trumphs over other pinball simulations in its remarkable mimicry of the actual physics of a pin-table. You can change the strength with which you pull the launch spring.

Psychedelia

CBM-64
£7.50
Freak-out cats
Llamasoft

★ ★ ★

What wakes Jeff Minter up in the morning? His llama clock, of course. Psychedelia is not a game — it's a program which generates patterns on a computer screen. Jeff exhorts us to (a) turn off the lights, (b) put on whatever music you like to freak out to (c) pick up the joystick and do it with feeling. There is an auto-demo, or you can define parameters or call in presets, and you can record about 30 minutes of joystick input in memory. Guaranteed to blow your mind, as they say.

Statix

BBC
£7.95
Novelty
Psion

★ ★ ★

A close copy of Atari's unsung classic, Qix, Statix does not quite get the details right. There is no high score table, and not as much variety as in the original. Still, the game has immerse appeal — of the sort guaranteed to grab those who disdain shoot-em-ups.

Superficially it resembles a painter-type game, but with the crucial difference that you are not confined to a grid. The idea is to cordon off 75 per cent of the screen while avoiding the Statix as it flutters around the open territory.

(continued from page 37)

there is a MAD-2 droid inside it — you must use this to try and find the missing cryo-wafer module which is the source of the trouble. Of course the AI-12 has internal defence systems and this is what your droid is shooting at.

You have to work your way through different levels — a maximum of 8192 screens is claimed but since they are all rather dreary and metallic there is not much to choose between them.

What you have to examine is the actual colour of the plates. All plates on the entry level have a top colour of light blue. There are eight different colour groupings. Different colour groupings have different ways of clearing plates. On some levels you drop time-bombs, on others — shoot to kill.

Every so often you get a chance to jump levels, otherwise the game would be very boring as it admits in the pamphlet.

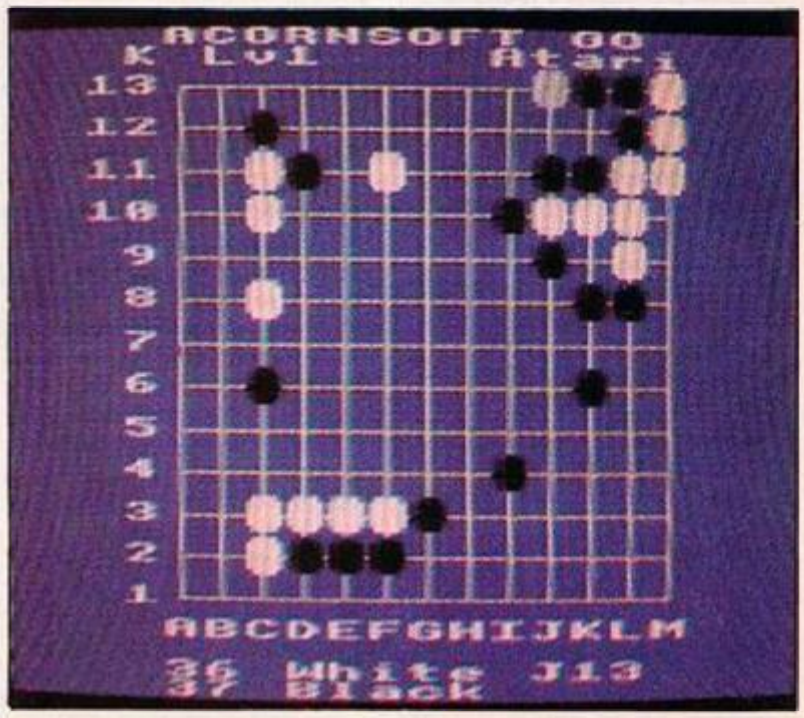
You are given a rough map, but it covers only one quarter of the entry level. The solution to the game lies in screen 8152 and a large phase counter is provided at the top right of your screen to mark your progress. You are prohibited from entering certain areas without tokens or passwords. You are told where to find the tokens — occasionally — after each completed screen.

Paul Bond.

GO

- *BBC*
- *Acornsoft*
- *£9.95*
- *Board Game*

★ ★ ★ ★



ACORNSOFT'S GO program is a considerable improvement on Edge Computer's version reviewed in the December issue. For one thing it plays on a larger board, 13 by 13. It also plays a stronger game

In Japan Go is the national board game, played by millions including several hundred professional players. But over here it has yet to really catch on, and the problem most Go players have is finding someone to play with. Which is why a competent home computer version is particularly welcome.

The game is far more difficult to program than chess. Recently, computer board game expert David Levy predicted that even in 10 years' time no program will be able to play Go at anything above beginner level. One reason for this is that the game does not lend itself to the brute force approach as easily as chess. On a full 19 by 19 board strict calculation of the consequences of a particular move is not so important. You could argue that it offers greater scope for intuitive play resting on pattern recognition and a "feel" for the position.

In view of this it is not surprising that Acornsoft Go is better at tactics than strategy. The program tends to get bogged down in securing a small group of stones when there are larger gains to be made elsewhere.

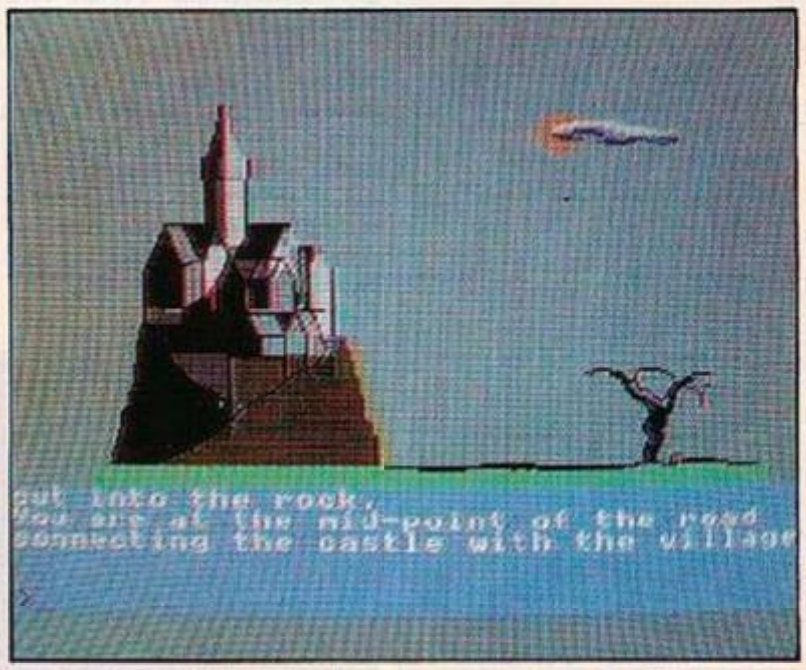
Nonetheless most beginners will find it hard to handle. As well as a handicap option, there are two levels of play and it is quick to move at both.

Simon Beesley

Castle of Terror

- *Commodore 64*
- *Melbourne House*
- *£9.95*
- *Adventure*

★ ★ ★



NO MAN HAS ever returned from the Castle you are informed by an old man in a pub. The reaction of any sensible person to this news would be to put as much distance as possible between him and said Castle. But, adventures being what they are, off you go, pausing only to grab any likely looking objects you find lying around the place.

The game is in two sections, the first is played in the village. When you think you're ready to tackle the castle you have to load the next section.

Success depends on persistance and close examination of the pictures.

There are 40 graphic screens altogether with accompanying eerie music. The program is rather fussy about accepting words, but does allow you to enter sentences so that you can skip several screens at once.

Your ultimate quest is to vanquish the evil Count, rescue the beautiful young maiden and with a bit of luck line your pocket in the process. Instant death — naturally enough — lies around every corner.

Lee Paddon

(continued on next page)

Star chart

Tristan and Isolde

CBM-64
£8.95
Arcade adventure
CRL

★ ★

Will they be playing this one in the foyer between acts at Bayreuth? I doubt it. Originally a German game, this may have lost a little in the translation, but when you consider the sort of trouble that people have gone to in actually using real mythology in games like Tir Na Nog, this one does little justice to the Ring Cycle. You pilot a little man through rooms and he gets eaten by monsters. Incidentally since the central characters are Kunibert, the hero and Kunigunde the maiden in distress — not to mention the unlikely Wumper, the baddie, where do Tristan and Isolde come in?

The Hellion

Oric 1/Atmos
£6.95
Shoot-em-up
Orpheus

★ ★ ★

With 101 screens, this should keep Oric shoot-'em-up fans happy. Your Hellion — mutant wasp — can be moved using the cursor keys, and the baddies fly at you from all directions. A fun game with a nice sense of humour.

MacMan and the Caber Eater

Spectrum 48k
Sinclair
Educational

★ ★ ★

The object of this program is to teach four to eight year olds to add and subtract simple numbers. This is done by multiple choice. It's visually appealing, and the quicker you can come up with the correct answer, the quicker MacMan will build his caber, foiling the dreaded caber eater!

SOFTWARE Shortlist

Witch's Cauldron

- *Spectrum 48K*
- *£6.95*
- *Mikro-Gen*
- *Adventure*

★ ★ ★

BUMPKINS OF the world unite. You have nothing to lose but your shape — you have been turned into a toad by wicked witch Hazel. Having failed the auditions for Paul McCartney and the Frog Chorus, it's down to you to seek out and concoct some spells and potions to help you regain human shape.

Witch's Cauldron is a graphic adventure game with a vocabulary of nearly 300 words. You can turn around in a room, getting different walls depicted on the screen, and if you examine things like the GRAMOPHONE very closely, you will find a DIAMOND

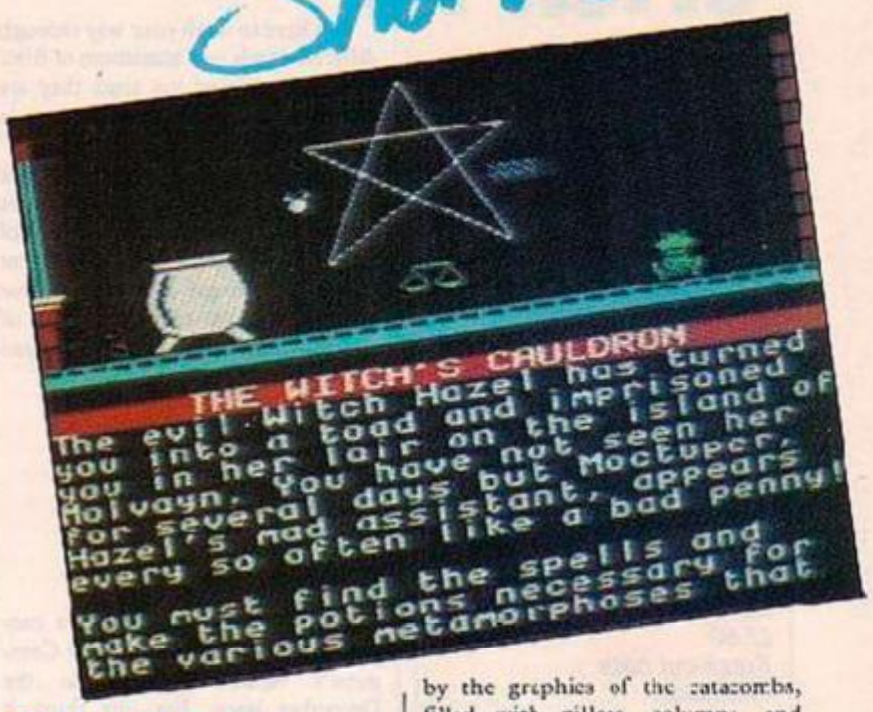
You can't pick up anything that a toad couldn't pick up, which basically means that anything large will have to be left behind. How a toad carries a diamond is a mystery to me — I guess it's okay if no-one gives him a hearty slap on the back. The plus side of being a toad in this game is that you can hop onto things like mantlepieces and examine them. While you can't open any doors you can hop up the chimney.

There is plenty of SOOT here and for your first trick you can throw it over your shoulder. Unfortunately one of Hazel's unpleasant creatures generally happens along and devours you, just as you are about to become more socially acceptable. If you can avoid becoming part of a monster's ment, you have a schedule of about 10 metamorphoses to go through. Talk about getting away for a change!

The program understands plain adventure English; it is possible to give commands like "Put the water in the cauldron".

The game contains over 90 different locations — most are illustrated with a full colour hi-res picture. Not all the objects are useful, and there are supposed to be around 700 different possible actions in the game. Good fun, but you have to remember that one small step for a man is a giant leap for a frog.

Paul Bond



Gift From The Gods

- *Spectrum 48k*
- *Ocean*
- *£9.95*
- *Arcade Adventure*

★ ★ ★

ORESTES HAS A problem. Mum ran off with another man and then ran off with his kingdom. The only way he can get it back is to enter the Labyrinth.

The Labyrinth, apart from being a tricky place to find your way around is filled with various monsters trying to sap our hero's energy. Fortunately he has friends in high places: Zeus has given him a Sword and Apollo has given him the Seven Tears of Icarus which can be used to mark chambers within the labyrinth.

Apart from the monsters, you've also got to cope with mum who is busy moving objects around. She'll also kill your sister Electra, given half a chance, which would be a blow as the Gods have revealed the solution of your quest to her.

All this plot detail gives the game plenty of flavour. It is complemented by the graphics of the catacombs, filled with pillars, columns, and animated monsters. The controls are easy to use using a combination of joystick movements and the fire button to move, fly, fight, pick up and drop objects. There is also a pause key which helps when making a map.

Your task is a long and difficult one. It's a large maze, and even when you find the objects, there are only six real ones among the 64 scattered around. Should Clytaemestra manage to kill Electra, your task will become immensely more difficult, so much of your time will be spent chasing Clytaemestra around so that she doesn't have a chance of getting to Electra.

The Greek legends of heroic quests make great themes for games and this is certainly a well executed example.

Lee Paddon



Star Strike

- *Spectrum 48k*
- *Real Time Software*
- *£5.95*
- *Arcade*

★ ★ ★

FOLLOWING UP their successful version of the arcade classic 3D Tank Duel, this is an excellent version of the current arcade hit. There are four screens to battle through: a space battle with the tie fighters, a low level run over the ground defences, the trench, and finally a shot at the reactor.

There are many difficulty levels running from the turkey shoot to the suicide run. All stages are in 3D with your cockpit controls in the foreground. The controls are nice and responsive with climb, dive, roll and fire; a variety of joysticks can be used.

Good meat-and-potatoes arcade action.

Lee Paddon

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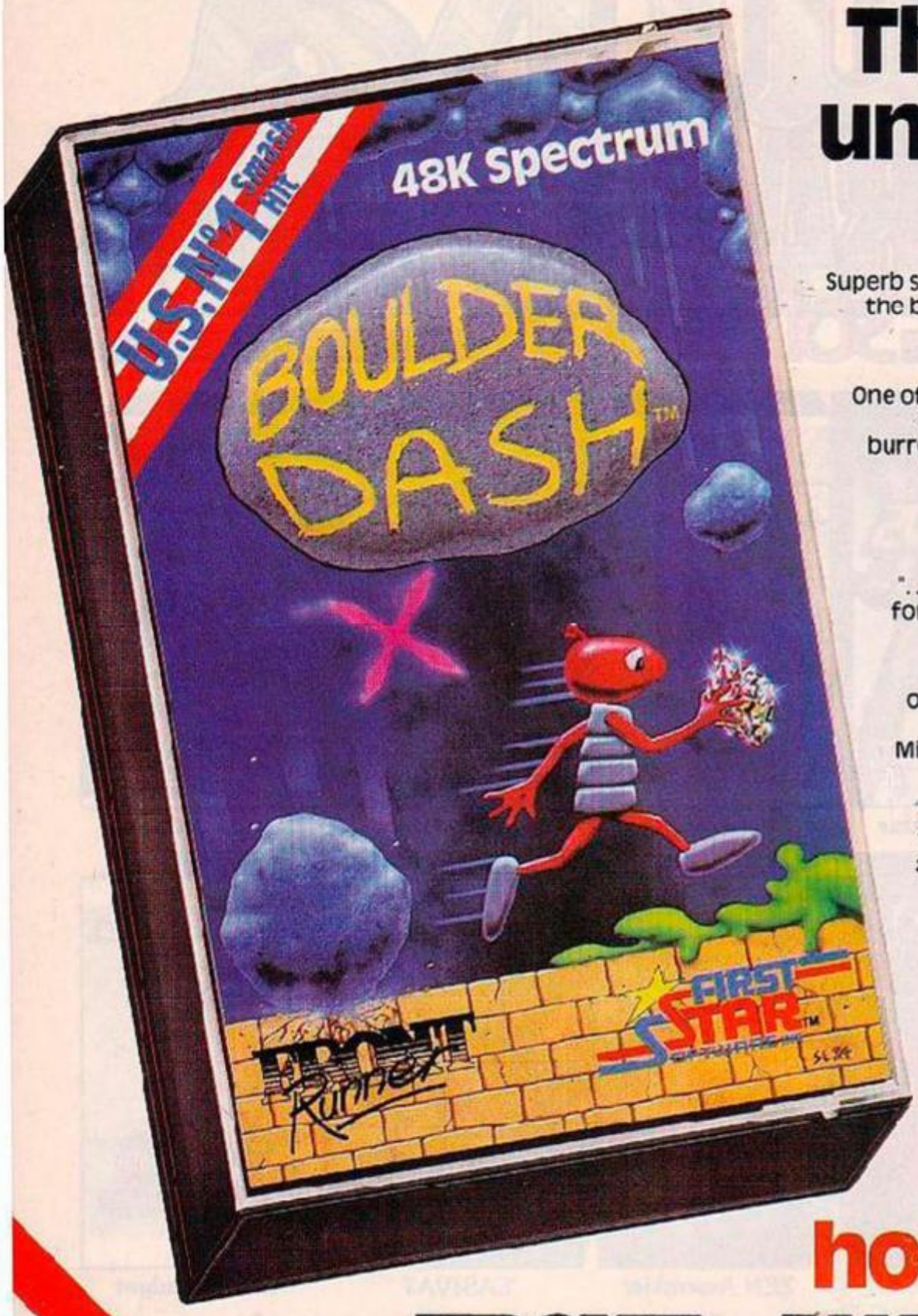
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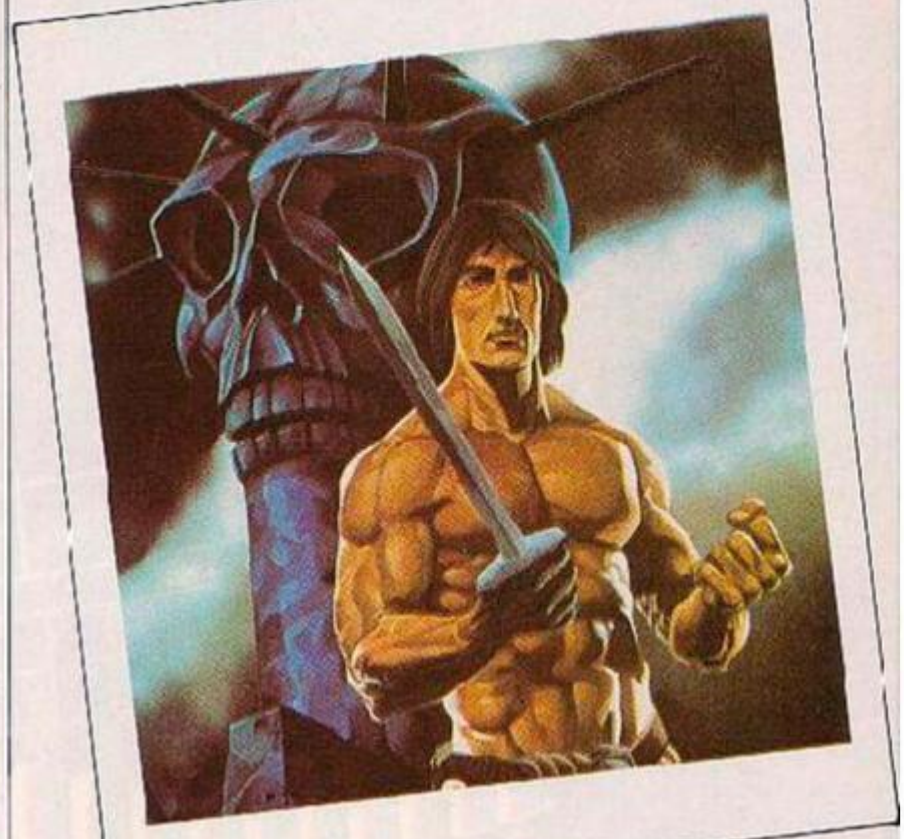
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Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.



NEWS oaeo rssu tttt h h

The crystal ball

At the time of writing, Doomdark's Revenge, the follow up to Beyond's brilliant Lords of Midright, has only been on the market a week but already I have heard of one player who has completed it. Astonishingly, David Harvey of Dereham in Norfolk managed to succeed in the new quest after playing it for just six days.

There's still the third part of the trilogy, The Eye of the Moon, to come. We lesser mortals are still gathering our armies in part 1.

If you've got any Christmas cash left, all three parts of The Ket Trilogy from Incentive Software are available in a handsome gift pack at the special price of £12.95, a saving of £3.55 on the set. A splendid bargain for adventurers.

A helping hand

Readers — can you assist with a plea for help form B. Kamphuis of The Netherlands concerning Quicksilva's Smugglers Cove?

He can't cope with the wide trench, oak door, trap door and collapsed tunnel. Can anyone help?

For Artic's Golden Apple players:

■ Shadow a hindrance?
ELOH OG NEHT FFO PMAL NRUT

■ Beggar and crocodile awkward?
CORC DEEF: ENO REHTONA HCTAC: RAGGEB OT NOMLAS EVIG

Dying of cold on the glacier in Acornsoft's Countdown to Doom?
HEICALG FO DNE IA RESAHP ERIF

Tower of Despair

Spectrum
Games Workshop
£7.95

SPECTRUM OWNERS should keep a sharp eye out for this. It is a text-only adventure with a big difference. For instance, the character set has been immaculately redesigned and decorated so that the text appears like a monastic illuminated manuscript. Very attractive.

The adventure is an enthralling atmosphere and is imaginatively detailed. This is an adventure where examining objects will pay rich dividends. A glossy booklet sets the scene and includes a couple of maps and a number of pictures of the major locations.

You must first find the Gold Gauntlet before you journey to The Tower of Despair, there to overcome the owner of the King of Skulls, the evil Malnor, who once more threatened the land.

Tower of Despair is just the program for those who like thick and rich detail, oodles of atmosphere and plenty of challenge. Games Workshop are perhaps better known for their expertise in other areas of the fantasy game world.

Blade Warrior

Spectrum
Cable Software

THIS IS A TEXT adventure, written with the aid of Gilsoft's ubiquitous Quill. The game has a largish vocabulary — over 140 verbs, fast response and an interesting plot. Your job is to hunt down the Black Witch, following in the footsteps of Mazar the Wizard who went before but has not been heard of in many moons.

The game has one of the best openings I can remember seeing in an adventure. You have been chased by a large band of Orcs and in your anxiety to escape have lost all your possessions. You now stand at a dead end, a wall at your back. There is a solid door in the wall but the Orcs are closing in for the kill.

The wall is unclimbable and if you think that simply rushing through the door is going to help, think again — the Orcs charge through and tear you to pieces. As they say on TV, now get out of that!

Forest of Doom

CBM-64
Penguin Books
£4.79 + VAT

THIS IS A computerised version of the best selling Fighting Fantasy gamebook of the same name.

It is mainly a text game, the prose being presented teletype style on a manuscript — a scrolling scroll! You make decisions by selecting from a number of choices given at the appropriate point.

The game remains very faithful to the book but in order to cram the whole thing on to a micro, some of the game's data has to be loaded in at different stages. The program automatically tells you when to do this.

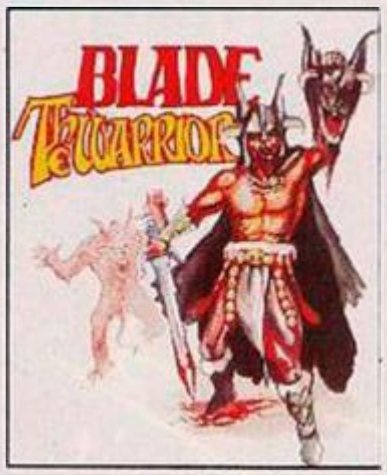
There are a number of options to make the playing enjoyable. You can control the speed at which the text is printed, even pause it, and can return to the start of a section, just like you would turn back a page in a book. You can even store and recall a scroll to your own text — very handy for making notes as you play.

I liked it — a splendid fantasy yarn and a refreshing change from the usual style of adventures.

Sorcerer of Claymorgue Castle

Various
Adventure International
£7.95

THIS IS the best adventure out of my leather pouch this month. I must confess to liking all of Scott Adams



adventures but this is definitely his finest yet.

You play the part of Beanwick, an inexperienced wizard, whose mission is to enter Claymorgue Castle and recover 12 lost stars. When you start you already have a number of spells and will find more on your travels. Only trouble is, you don't know what these spells actually do.

If you want attractive graphics you'll find them here.

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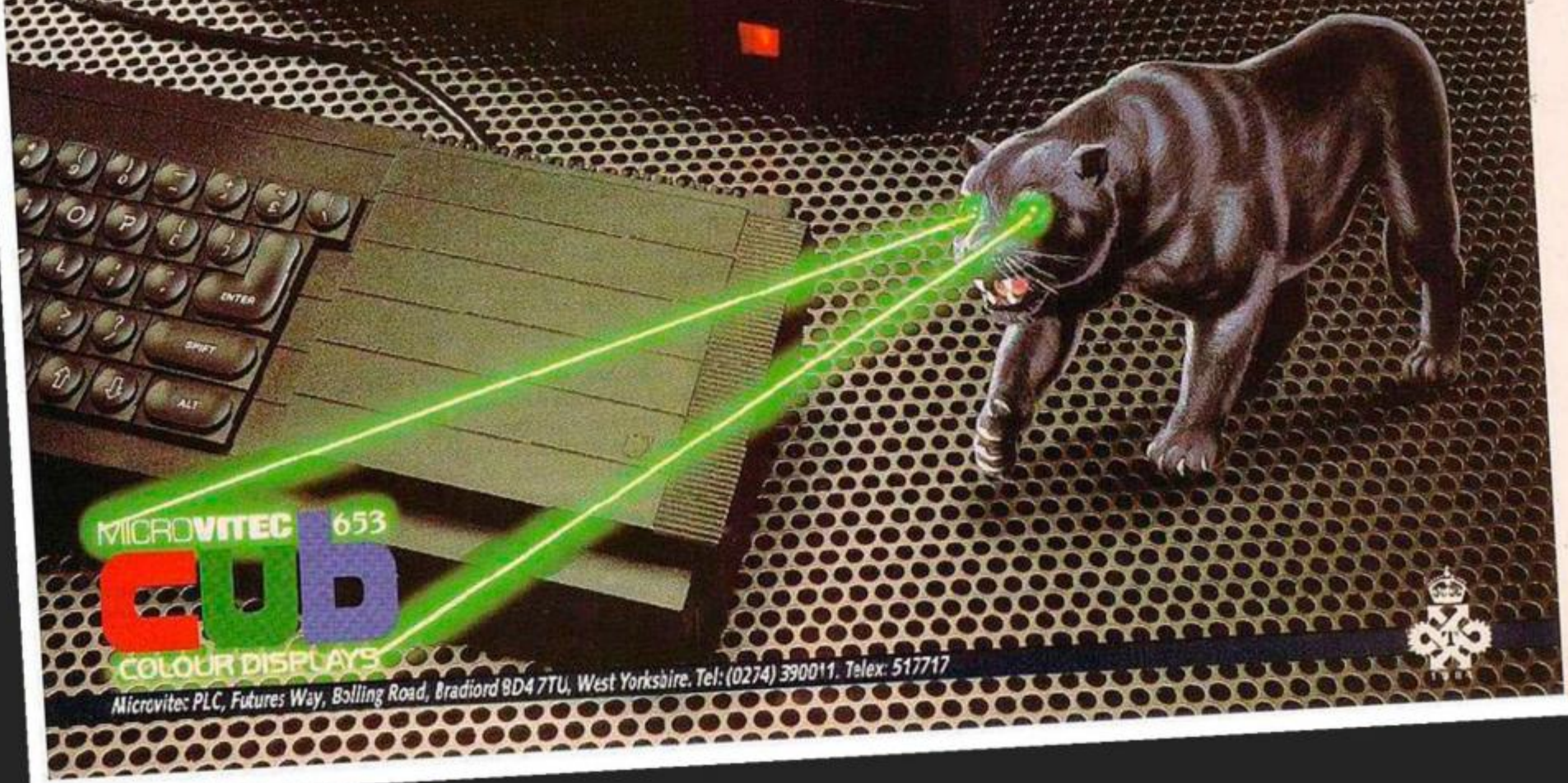
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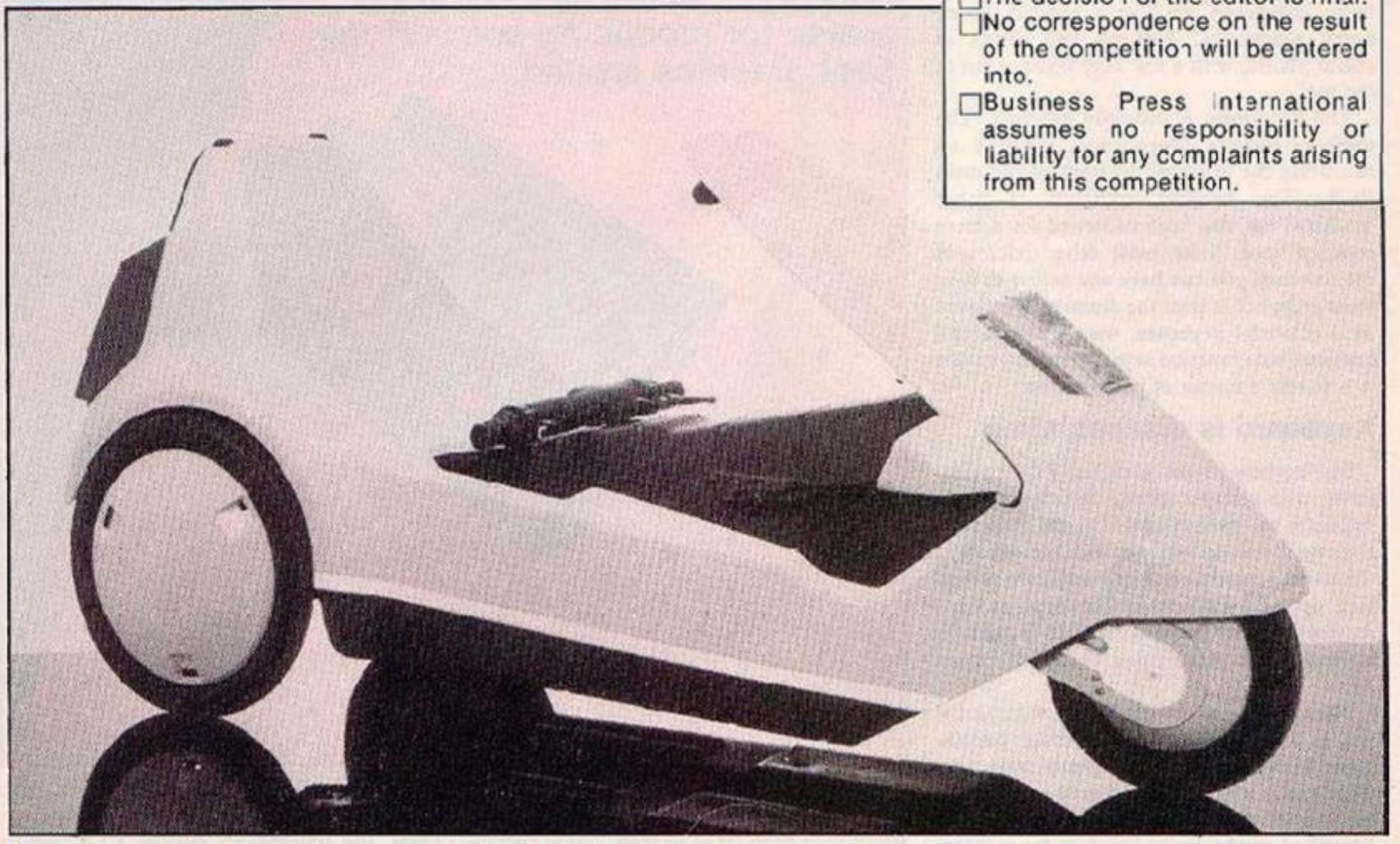
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- The name of the winner will be printed in the April issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in February 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
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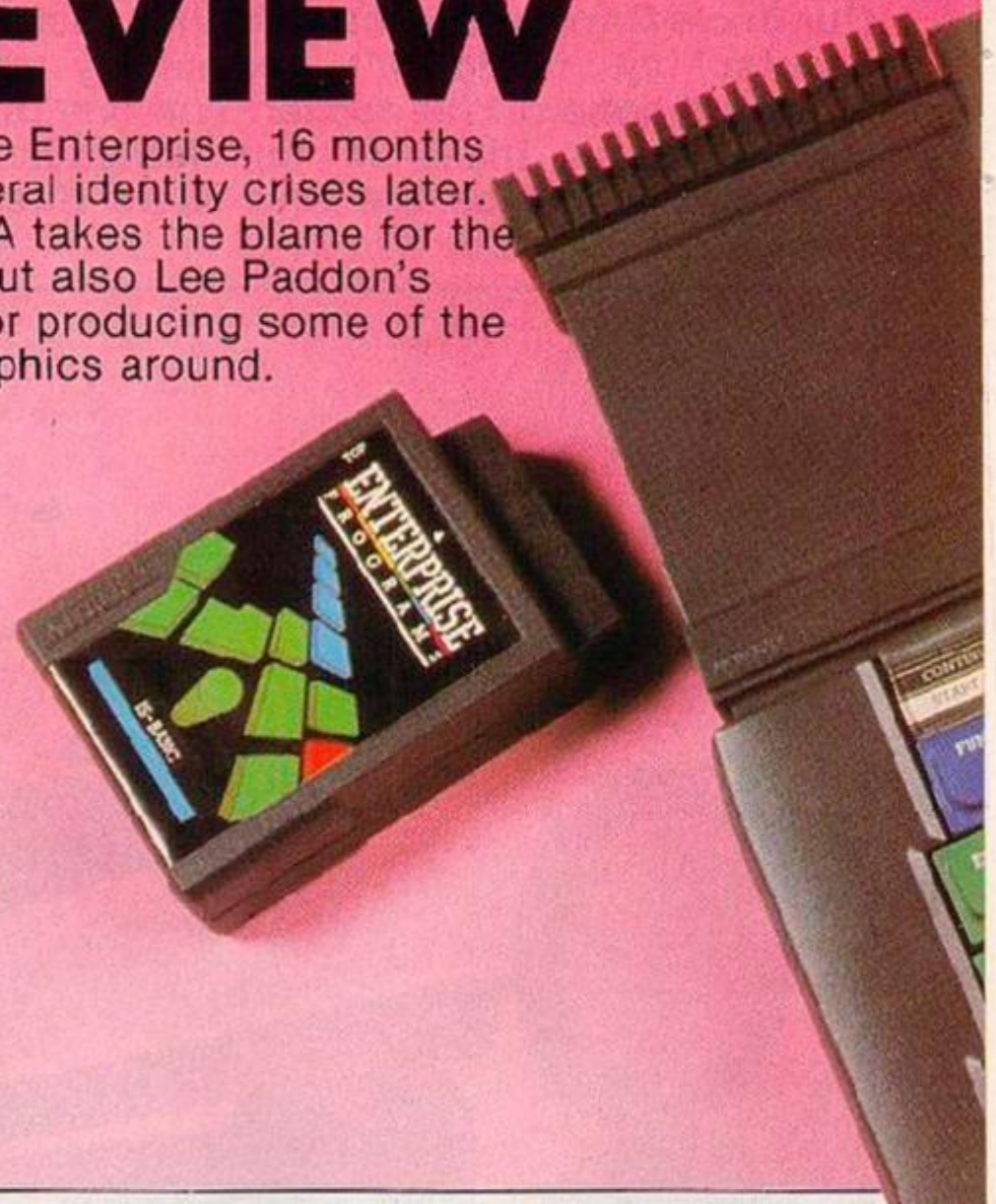
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ENTERPR

REVIEW

Enter the Enterprise, 16 months and several identity crises later. Nick ULA takes the blame for the delays but also Lee Paddon's praise for producing some of the best graphics around.



IN AN INDUSTRY notorious for broken delivery promises, the Enterprise stands head and shoulders above the competition. First seen in public in September 1983, the machine is only now going into mass production.

When first announced, it seemed to offer a level of performance most micro owners only dreamed about. However, a lot of bytes have flowed under the bridge since then. Several innovative new arrivals have beaten it to the high street, and the industry stalwarts are even more entrenched with huge user bases and software support.

A year or so ago, a machine had to be good to succeed, now it has to be very good to even survive. So how does the new machine measure up to the competition? Geoff Hollington, the designer of the Enterprise's casing, had some hard words to say about the looks of other machines when *Your Computer* interviewed him in January 1984: "Most home computers are just a printed circuit board sandwiched between two sheets of cream plastic, with a few keys sticking out of the top".

The Enterprise is certainly different. The machine is only 33mm high, achieved by mounting the keyboard in front of the main PCB. The box-like contours of other machines has also been eschewed for a more rounded look. Like most other micros of recent years, you can have any colour as long as its grey, but at least the drabness is relieved by a colourful keyboard, with green control keys and blue function keys. Whether you like it is purely a matter of personal taste.

Keyboard is disappointing

The keyboard itself is rather a disappointment, with a rather spongy feel that will not endear it to touch-typists. On the plus side, the keys are nicely laid out, with everything in the usual positions, and any odd keys tucked well out of harm's way. The most striking feature of the keyboard is the built-in joystick, instead of the more usual cluster of cursor keys.

This looks a bit on the flimsy side, and it will be interesting to see how much punishment it can take from the games fraternity. That aside, it is certainly a very easy way to edit text and programs, although the hamfisted might easily knock it by mistake. There are eight function keys, which can be used with the shift and Alt keys to produce 32 combinations.

Around the back of the case are a series of ports. Enterprise seems to have cut costs here and we are left with the old edge connectors, instead of a few proper sockets which cost that little bit extra. There are ports for two joysticks, an RGB monitor, a printer and a serial/network port.

There are also the necessary sockets for a television, a power supply but no on-off switch, and a cassette port. The reset button is usefully positioned at the extreme left of the rear panel. One press for warm reset, two for cold.

The Rom bay on the left of the machine can accommodate Roms up to 64K and on the right is the expansion socket which gives access to not just the main address and data buses, but the audio and video circuitry as well.



The internal architecture of the Enterprise is unusual. Bank switching and sideways Roms have been taken to their logical conclusion. The address bus is extended from the usual 16-bit Z-80 bus to 22 bits and hence 4Mbytes. This is achieved by dividing the address bus into two.

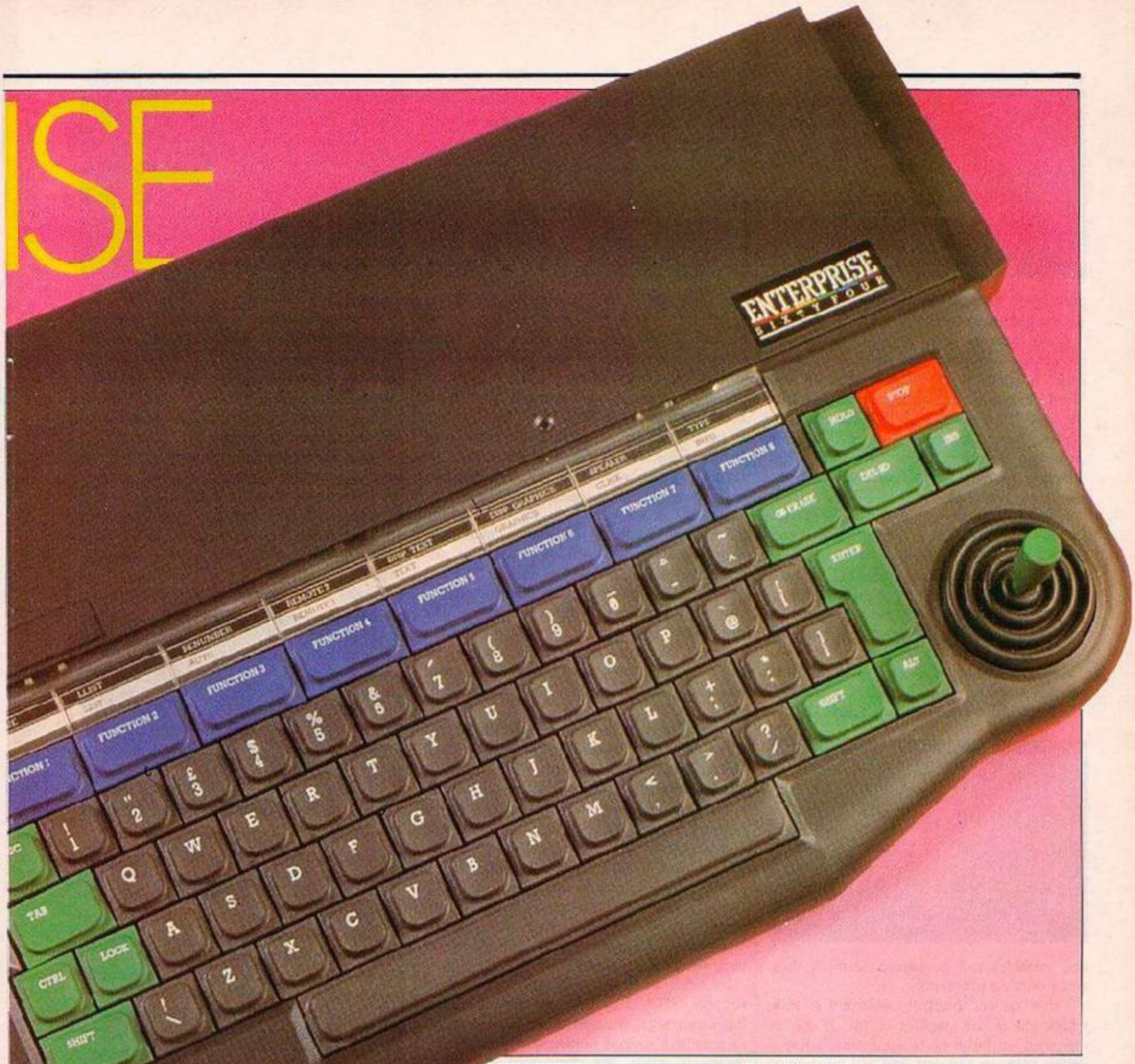
The two most significant bits are used to select one of four 16K pages. This page address is read from an eight-bit register in Dave, the Enterprise's custom ULA, which also handles sound production. Of these 256 pages, the top four are the video Ram, which can also be shared by programs, and the operating system's scratchpad.

The system Rom sits in the bottom two pages, and the cartridge turns up in pages four to seven. While this is all very clever, it does rather tie up the processor, which has to mess about with page address. Still, when you've got a Z-80A processor cranking along at 4MHz, you've got a little time to spare.

The operating system EXOS has been designed for flexibility. All devices are accessed using channels. This will of course allow simple expansion.

Apart from Dave, the other custom chip in the Enterprise is Nick, apparently the cause of all the delays. Nick handles the screen, and it hardly seems surprising some trouble was encountered with this revolutionary design. Most computers have a certain amount of memory assigned to the display. This might

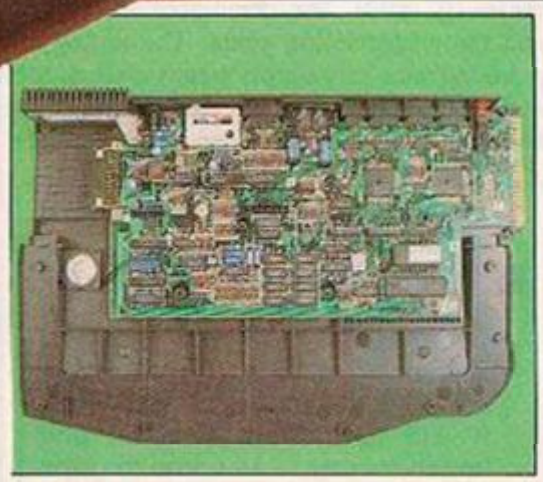
ISE



vary with the video mode in use, but you are always sure where it is.

Nick changes all that. Any part of the 64K of Ram can be assigned to Nick. The user simply defines parameters of mode, width and height, and the operating system assigns the required amount of Ram to it.

It is a similar concept to graphic windows, but these windows can be slid around the screen at will. There are five modes, lo-res graphics, hardware text, hi-res graphics and software — 80 column — text, and attribute mode which mixes the two. On top of that you



also have to specify the number of colours you want. This can be 2, 4, 16 or 256 colours. The more colour, the less horizontal resolution.

Maximum resolution is 672 wide by 512 deep, although this can be doubled using "interlace". The text is on an 8 by 9 matrix, with 25 lines. The versatility of the video display will enable complex graphics to be built up easily, and with a modest memory overhead.

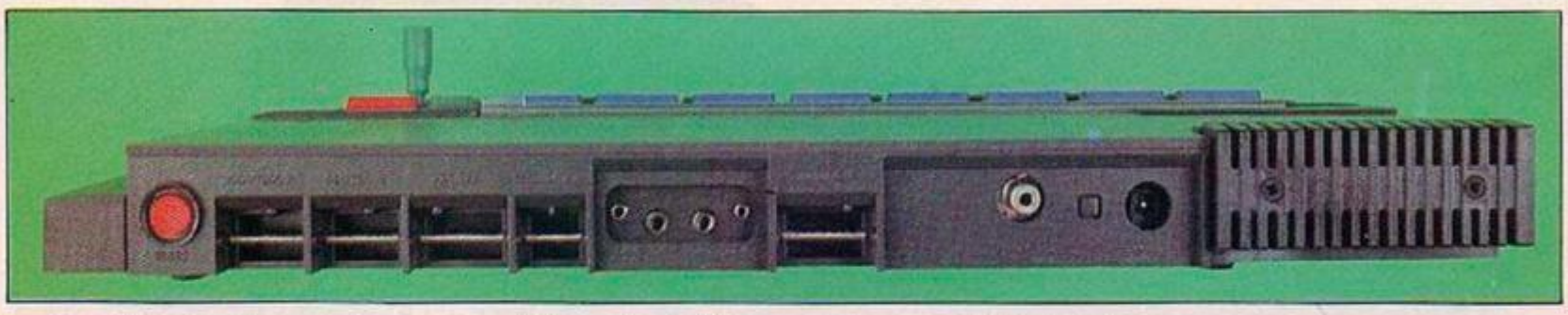
When Dave isn't busy with memory maps, he's producing some very pleasant sounds. There are three sound and one noise channels. The sound is in stereo over eight octaves, and rather wasted on the internal speaker, using external speakers or headphones is a must if you want to appreciate Dave's finer points.

Each sound command can state volume and pitch as a function of time, in stereo. Various special effects can also be produced using distortion, filtering, using another sound channel to determine the cut-off frequency, and ring modulation.

The Basic comes on a cartridge and is another one of the machine's strong points. Whilst retaining all the usual features of standard Microsoft basic, IS-Basic has features which normally only come as Basic extensions.

The central philosophy is obviously to encourage the programmer to think structure, and borrows many features from Pascal. If this sort of language had been the standard when Basic got going, it might not have got

(continued on next page)



(continued from previous page)
such a bad name for itself.

Apart from the usual If . . . Then . . . Else structures, which can be carried over several lines, it supports Do loops using While or Until conditions at the beginning or end of the loop. There is also an Exit command for further flexibility in structures. The Case statement is rather like setting up a "flag" which is tested to determine if certain statements are executed.

IS-Basic supports the use of "global" and "local" variables. This means that a subroutine can use the same variable as the main program without being affected, merely passing parameters to the main program as needed. This means that subroutines can be transportable from program to program, without having to be rewritten.

An extension of this idea is that several programs can be resident in Ram at the same time, with the same line numbers. Control



and variables can be passed between them when editting programs.

The principal graphics command is Plot, which moves the graphics cursor. If the coordinates are followed by semicolon, a line is drawn between the new and old position in the current ink colour. There is also a set of Logo type graphics commands as well as Ellipse and Fill commands. Ink, Pen and Border colours are selected from a palette of 256 colours. These can be selected by number, or name, or you can specify the amount of red, blue and green you want. Possibly more use to commercial artists and printers than programmers.

Sound commands are simple. The Basic sound command can be followed by a number of parameters stating pitch and volume over time and any special effects. A series of sound commands can be issued to the four channels, and these sit in a queue waiting to be executed. In case you lose all track of the duration of sounds on the various channels, a Sync command will set you straight, or just Clear the queue and start again.

The Basic is generally very comprehensive, and really lets the user get at the guts of the machine without having to resort to machine code all the time. If anything it might be accused of being rather longwinded and unwieldy, but then you don't have to use all of it.

The very wide format of Basic commands means that very little error checking is done when the program is entered. There are also a number of words which can only be entered in immediate mode, although this is really only a minor criticism of a fascinating dialect of the Basic language.

The only reason I can imagine for a programmer wishing to leave Basic is speed. I'm afraid IS-Basic isn't going to keep Beeb owners awake at night. Even the humble Spectrum shows the machine a clean pair of heels on most benchtests.

Included with the machine is the power supply, UHF lead, two cassette leads, the Basic cartridge, the inevitable demonstration cassette and several booklets. These are the setting-up guide, the demonstration manual and the programming guide. The setting-up guide explains very simply what's what on the machine, so that the terms used in the other books won't mystify even the complete novice.

It also explains how to load taped software. This is certainly a simple process on the Enterprise, you just hit the button marked start. To make sure you get the playback volume right, there is a blob on the display during loading, and if this flashes green to red, the volume is correct.

As far as the demonstration tape goes, the programs are hardly dramatic. But at least they are short Basic programs which will actually teach you how to write your own rather than the designer's *pièce-de-résistence* in 30K of machine code which teaches you very little.

Finally we come to the programming guide,



which at nearly 230 pages looks fairly daunting for even the seasoned veteran. It is divided up into three sections: getting acquainted, the tutorial and the reference section. Getting acquainted is the standard beginner's introduction, but worth a glance through by experienced programmers. It steers the path between mystification and condescension very well.

The next section introduces the core of IS-Basic. It spends a large amount of time on the structure commands, with plenty of examples, but towards the end rather glosses over several of the more interesting subjects, for instance it barely mentions attribute graphics.

So while the beginner will have something to keep him busy, anyone interested in graphics will be forced to pick up the clues from the demo tape, or wait for the inevitable flood of "Get the most from your Enterprise" type books. The reference section gives a comprehensive list of IS-Basic commands, a glossary of computer jargon and a few more hints on using sound and vision. Not a bad effort all in all.

The Enterprise has a built-in word processor, which although rather crude could save on TippEx if your typing is a bit rough. It lacks features such as "search and replace", block move or block delete. It is, however, easy to use, with helpful on-screen prompts. Another handy idea is that a listed Basic program becomes a word processing file, so you can scroll up and down the whole listing. How many times have you let the line you wanted to edit scroll off the top of the screen and cursed this end-of-the-world effect? ■

CONCLUSIONS

- For £250, or £350 for the 128K version due out later this year, there is no doubt that the Enterprise offers the best value for money in hardware terms. The Basic is easy to use and will appeal to the beginner. To the more experienced programmer, the completeness of the Basic will be a revelation — no more Peeks and Pokes.
- They will also be able to delve quite easily into the depths of the operating system due to the open nature of the system and its channel based architecture. The hardware buff has also been catered for with the inclusion of the sound and video lines on the expansion bus.
- Perhaps the only cloud on the horizon is the reaction of commercial software houses. Because of the revolutionary concept the machine embodies, it will take them time — and hence money — to come to grips with the machine, especially if they want to get the most out of Nick and Dave.
- Thus Enterprise may find itself caught in a Catch-22 position where commercial software will not be developed until there is a big user base, and people won't buy the machine until they see that software is available.

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VIEW AND SCRIBE



TEXT IS IDEALLY suited for manipulation by a microprocessor. The alphanumeric symbols involved can all be described by the permutations of eight bits — one byte — and many documents are shorter than the 16 bit addressing capability of the 6502 and Z80 CPUs.

VIEW and SCRIBE are word processor programs for the BBC microcomputer. VIEW is the official Acornsoft product and SCRIBE is distributed by Eucon Ltd. in Swansea — Merlin Computer Products, Eucon Limited, 35/36 Singleton Street, Swansea, SA1 3QN — Telephone 0792 467980.

A "word processor" program is comparatively easy to write in Basic provided that you limit yourself to a short text and only a few facilities. These programs are often published in computer magazines but really ought to be put into a different category as they bear little resemblance to a professional piece of word processing software. A good wordprocessor is like a sharp woodworking plane — unobtrusive, effective, versatile, ready to hand and conducive of good results.

There is, however, no single best wordprocessor because different people use "text" in entirely different ways for different purposes. A journalist will rarely want to handle a document longer than three or four thousand words. Conversely, the ease of operation and the speed at which text can be entered may be terribly important.

The layout of the printed text is likely to follow a simple pattern. On the other hand, a technical author, a mechanical engineer or a biochemist may require more than 80 columns for the production of tables and complex format controls to permit the insertion of diagrams, the representation of mathematical symbols and references to footnotes at the bottom of the page.

A person running a small business may wish to incorporate individual names and addresses into letters, and may want to alter the contents of the letter according to whether or not the recipient has paid a bill recently, enquired after a product or made one of a number of different mistakes in filling out an insurance proposal.

You could write one program that would deal with all these tasks and some people have tried to do this. "Integrated" software packages such as "1-2-3", "Symphony", and "Jazz" aim to offer both word processing and data handling in one package so that text can be mixed with the results from a spreadsheet analysis, or merged with data from the built-in database program.

But it is still very difficult to make the package comprehensive and simultaneously easy to use.

A menu, for example, is a screen display which allows you to choose which operation the program should carry out next. Menu-driven programs are easy to use but tend to become irritating after some time as the user becomes familiar with the range of options available. This problem becomes particularly important when the computer is used with a serial terminal rather than having a memory mapped display.

It takes longer to clear and then write a screenful of information on a serial terminal. Wordstar solves the menu difficulty by allowing the user to choose any one of four levels of help. At one extreme half the screen is taken up with helpful messages; at the other, you are assumed to know what you are doing and no messages are displayed.

VIEW can be used with either a cassette recorder, or one or two disc drives. It has many attractive features and some important drawbacks. If you use VIEW with the BBC micro set to Mode 3, you will be able to type and display text as it will look on an A4 sized piece of paper. You will be able to hold about 1,500 words of text in memory at any one time. Using a 40 column display VIEW will hold approximately 25,000 characters in memory, about 4,000 words. Secretaries and other professional word processor users will find it very difficult to work with a 40 column display.

The top line of the VIEW screen is reserved for the "ruler" which shows where the left and right margins are set, the position of any tab stops, an optional bell signal, and whether the text will be justified or not. Further information is given about Insert/Overwrite mode and Format mode which is another name for wordwrap. The starting options for VIEW are all fixed as the program is contained entirely in ROM firmware. Figure 1 shows two typical ruler lines.

SCRIBE uses a similar ruler line and is a very friendly progam which uses menus and messages to show the choices that are open to you at any stage of processing a document. SCRIBE is supplied as an 8K Eprom and a 40 or 80 track disc holding a number of procedures and utilities. To make sensible use of SCRIBE you will need two disc drives. The first, drive 0, holds the SCRIBE disc while the second is used for the disc holding the text. You could manage with a single disc drive but SCRIBE does use the program disc quite often to call up editing utilities such as "Reformat" so you must keep your documents on the same disc as some of the SCRIBE procedures.

Figure 1. VIEW Format rulers.

F I>..........................*.........................*..b.......................<

Produces text that lies between the triangular arrow margins. The computer beeps when the cursor passes the "b".

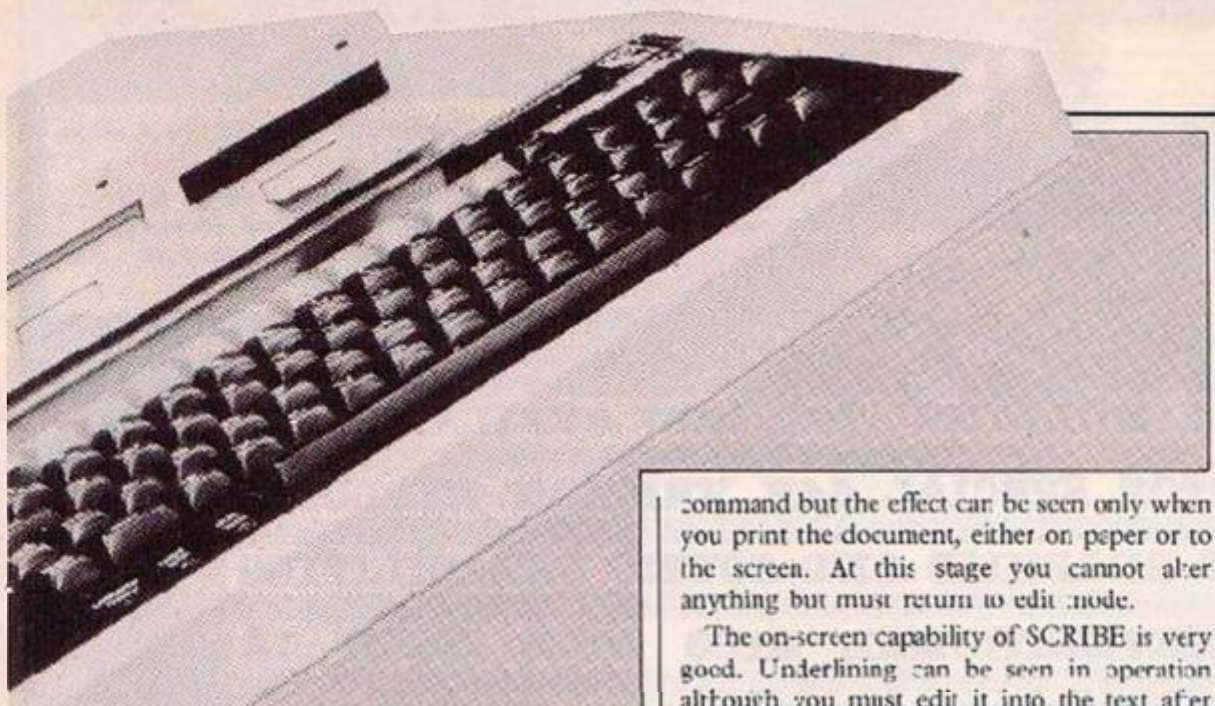
F I........................>...........................*.........................*...<

This ruler line shows a wider left margin and two tab stops. Up to 126 ruler lines can be set in a document; more than enough for almost any purpose.

Figure 2. Onscreen capabilities.

	VIEW	SCRIBE
Enter text 40/80 cols	Yes	Yes
Enter text > 80 cols	Yes (max 132)	No
Centre text	No	Yes
Fill & Justify	Yes	Yes
Right Justify	No	No
Underline	No	Yes
Page breaks	No	Yes
Set page breaks	No	Yes

	VIEW	SCRIBE
Wordwrap ON/OFF	Yes	No (always On)
Tab stops	Yes	Yes
Decimal tab stops	No	Yes
Left and Right margins	Yes	Yes
Reformat paragraph	Yes	Yes
Global Format	Yes	No (automatic)



John Dawson reviews View and Scribe — word processing programs for the BBC.

Unlike VIEW A 2.1 and many other microcomputer based word processors, SCRIBE establishes a number of fixed format "pages" when you create a document. The pages are laid out on the disc and you fill the pages as you type. An 80 track single density disc will hold between 55 and 60 A4 sized SCRIBE pages. The enormous advantage of this approach comes when you wish to move backwards through a document.

The Edit command in VIEW is fine provided that you only want to work your way through the text from the start to the finish. But if you forget to carry out some editing or decide that a couple of paragraphs will read better earlier on, you must save the block of text on to the disc, finish editing the text and start all over again from the beginning. When you come full circle you can set a marker, exit to the command level and read in the block of text from the disc. If the block is longer than the spare capacity in VIEW — about 1,200 bytes in Mode 3 — you will have to change into Mode 7 because VIEW stops reading from the disc when the free space is full.

Using SCRIBE you can move to any page in your text just as you wish. Press function key f7 and the prompt line asks "Page number?". The up and down cursor keys will select the previous page or the next page respectively after saving the current page to the disc.

For longer reports, book chapters, articles, essays and epic poems, this facility cannot be overrated.

If you want to move beyond the adjacent pages you simply enter the absolute page number and the program will move to the page you want. The number of the current page is displayed constantly at the top of the screen. There are two other important commands that will repaginate the document, moving excess material into or out of consecutive pages until all is arranged correctly.

The on-screen editing and display capabilities of the two programs are shown in figure 2. Note that this figure refers to what the program can do to display text on the screen while you are editing it. VIEW A 2.1 can right justify text, for example, by using an edit command but the effect can be seen only when you print the document, either on paper or to the screen. At this stage you cannot alter anything but must return to edit mode.

The on-screen capability of SCRIBE is very good. Underlining can be seen in operation although you must edit it into the text after writing the document rather than being able to turn it on and off as you go along.

Using SCRIBE I miss the Shift cursor keys in VIEW which allow you to move along a line one word at a time. However VIEW will not move the cursor to the right hand end of the previous line when the cursor reaches the left hand margin and this and other drawbacks create a niggling handicap. Neither program is perfect in terms of the cursor commands. The edit facilities are shown in figure 3.

SCRIBE permits far better control of the printed document than VIEW. The Printer driver generator program that is available for VIEW does make use of the features in a range of printers but the codes for obtaining the commands, although superficially easy to use, are clumsy for out of the ordinary functions such as one and a half line spacing. SCRIBE presents you with 18 global options to change the format of the text or to switch between a serial and a parallel printer.

Once you have established the conditions that are to apply to a particular document you can save them with the text so that they will come into operation when you access the document again. You can alter the master disc to make the program boot up with a different set of default values — a clever combination of firmware in the Eprom and software on disc.

Figure 3. Edit commands.

	VIEW	SCRIBE
Move cursor by word	Yes	No
Move cursor by page	Yes	Yes
Top/bottom of text	Yes (short text)	No
Move/copy/delete block	Yes	Yes (limited)
Recover deleted text	No	No
Delete word/ sentence	Yes	No
Underline	No (printer)	Yes
Markers	Yes (6)	No
Swap upper/ lower case	Yes	No
Search whole/ part	Yes	Yes
Search and replace	Yes	Yes
Copy case of search text	Yes	No
Merge files	Yes	Yes
Edit Basic programs	Yes	Yes

Figure 4. Printer format commands.

	VIEW	SCRIBE
Left margin offset	Yes	Yes
Top margin	Yes	Yes
Bottom margin	Yes	Yes
Maximum print width	probably 132	80
Printer initialisation	Printer Driver	Yes
Control characters	No	Yes
Redefine characters	Printer Driver	Yes
Headers	Yes	Yes
Footers	Yes	Yes
Automatic page numbers	Yes	Yes
Additional registers	Yes	No
Multiple copies	No	Yes
Two sided headers (books)	Yes	No
Set page end	Yes	No (on-screen)
Line spacing	Yes	Yes
One and a half spacing	No	No
Single/ continuous sheets	Yes	Yes
Print part of text	Yes	Yes
Use form feeds	Printer Driver	Yes
Change pound character	Printer Driver	Yes
Mail merge	Yes (limited)	No (database *)

CONCLUSIONS

- Both VIEW and SCRIBE are more powerful and easier to use than Wordwise. SCRIBE works in much the same way as a commercial word-processor such as the Wordplex series. It is a deliberate, careful program well suited to professional computer users, that is people whose livelihood depends on not making mistakes and getting work done on time.
- If you work under great pressure producing short documents such as press releases then VIEW will be marginally faster to use. You must set against this the continuing errors in the VIEW program such as the failure to recognise a full file specification.
- The documentation for VIEW is quite long but curiously incomplete.
- VIEWINDEX and the VIEW Printer Driver Generator program add to the facilities in VIEW but the combination of an Eprom and disc in the SCRIBE package is flexible and powerful. An integrated database package for SCRIBE will be on the market when this article is in print.
- Both VIEW and SCRIBE are good wordprocessors and you should try to test both before deciding which to buy. Probably I shall use SCRIBE for most of my writing — articles and books — but VIEW is no bad choice either.

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COMPETITION of the Year



WHEN WE SET the Competition of the Year we thought you would find it a doodle. Most of the quotations contained a clue to the personalities who said them. The others could be found by a process of elimination. Who else but Acorn supremo, Herman Hauser, could have talked about leapfrogging Clive Sinclair? And surely Douglas Adams is the only one who makes jokes about computers.

But only a third of the entries matched up the quotations correctly, with more people stumbling at the second quote than any other. This was said about the Spectrum in 1982 by an unusually flippant Clive Sinclair. The correct order of personalities was as follows: 6, 7, 5, 8, 2, 4, 1, 10, 3, 9.

Clive Sinclair's quip was perhaps a little too close to the bone. A large number of the quotations submitted as tie-breakers were about Sinclair's delays and the claimed unreliability of his computers. Paul Mummery, 48 Woodland Gardens, N. Wooton, King's Lynn, Norfolk had the Queen waiting to knight Clive Sinclair: "What do you mean, Clive Sinclair might be a little bit late?". This wins him a VTX-500 modem for his Spectrum.

The best quote along these lines came from K. Joughin, 32 Woodlea Road, London N16, who wins the Yamaha CX-5M for "Never deliver today what you can deliver in six months' time". Tactfully attributed to A Computer Manufacturer, we felt this struck a suitably sonorous and pithy note. A. Goodsell had the same idea expressed slightly differently and wins a copy of Melbourne House's adventure program, Sherlock Holmes.

D. Walker, 16 Manor Gardens, Hunmanby, Filey, N. Yorks, almost got it right with: "So, Merlon, we are agreed, Mr Walker of Hunmanby will take the first prize", attributed to the Editor. What the Editor actually said was: "Mr Walker shall have a modem".

The other modem goes to BBC owner J. Watmough, A16 Hepburn Hall, St Andrews, Kingdom of Fife, Scotland who had Herman Hauser saying, "Well, has anyone run a power station with a ZX-81?".

We awarded a day at the controls of a Rediffusion flight simulator to M. Burton, 15 Boswall Quadrant, Edinburgh. His inspiration was: "O Romeo, Romeo, wherefore art thou Romeo — Silence, fair maid, I hath nearly scored a million at Pac-Man". P Aylin's quote was "I never win anything in these bloody competitions". Not in itself original but we were touched by his rather earnest "N.B. this can only be funny if I actually win something" — for which he wins a copy of Sherlock Holmes.

For the rest, copies of Sherlock Holmes to A. Karhumaki, D. Tordoff, B. Allan; and copies of Elite to N Olner, S. Cunningham, T. Hunt, C. Fraser, F. Hatten, A. Furness, J. Hammond, M. Simper, and I. Davidson win themselves a binder each.

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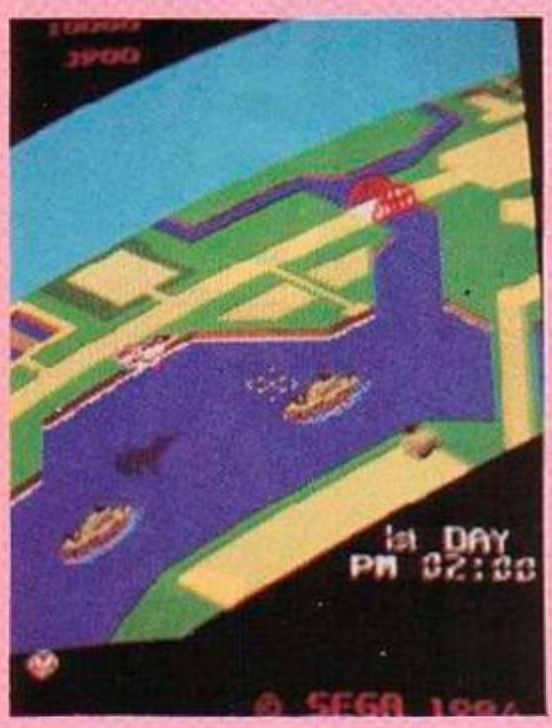
It seems that what happens in the arcades is a good guide to what will happen on home micros. Meirion Jones investigates.

WHEN CHARACTERS like Pac Man sprang from the screens of the expensive purpose-built consoles lurking in pub corners on to home computers everyone was amazed.

Back in 1977 if you wanted to play Space Invaders at home you had to buy a £1,500 monochrome arcade monster. If you were lucky you could even have colour — although the conversion looked as if it had been done by an over-enthusiastic Blue Peter presenter.

"Well all you need for this toy is a black and white video game and three strips, red green and blue, of see-through sticky backed plastic, just stick the plastic on the screen and there you have it. Super. Next week Eugene will be showing you how to build your own software house, and Clive will tell you how to deliver a micro within 28 days. Great."





And when you finally tired of zapping invaders it would cost you another £1,000 to change to a different game. Within two years most arcade games make the transition to the home micro often losing little but price on the way. Machines like Atari's £130 800XL makes a surprisingly good alternative to pumping cash into a coin slot if you want to play Pole Position or Pac Man, and you can have a whole library of different games for a few tens of pounds.

So if we want to look at the action games of the future for our home computers the first place to look is today's arcades. Obviously adventure games which may take hours or days to play are developing faster for the home than they are for the coin machines. There the operators are looking to make a fast buck.

Even so, the graphics are increasingly emulating those of their arcade cousins, despite the advantages that custom video circuitry gives the slot machines. Often they use the same processors — Atari's latest System 1 machine for instance which is introducing Marble Madness to windswept seaside piers and unswept motorway service areas around the country is based around Motorola's 68010 — a chip off the same silicon block as the 68008 in Sinclair's QL.

Even the technological edge which laser-based games such as Firefox and Mach 3 have given the arcades is about to be nibbled away by the likes of Pioneer with its MSX micro plus laser disc home system — *Your Computer* December 1984. The Pioneer will come with the relatively crude Sega Astron Belt which launched the first wave of laser slot machines in 1982.

Astron Belt used a deliberately degraded Star Wars style background film on video in the hope that the relatively crude computer-generated profile of a spaceship which you guide to the death star would not appear too artificial. Its successors had different strengths, Atari's Firefox put more effort into the computer animation while Mach 3's appeal stemmed from its power to convince you that you really were manoeuvring an F-15 hurtling over the tree tops. Even if you occasionally wondered how the enemy attack helicopter managed to fly backwards at 500 miles an hour just so you could get a clean shot at them.

But the latest generation of laser generated cartoon games — like Super Don Quixote — would make Hanna Barbera drool. You can sit and watch the entertainment rather than play yourself as a would-be windmill tilter guides the Don past hazards new fencing off giants or skipping from rock to rock to avoid being swept off in a flood.

Unfortunately the graphics have sometimes outstripped the abilities of the writers to make the games challenging. It is easy to see why Minoru Arakaura — the American President of Nintendo, one of the Japanese companies which has been at the forefront of arcade entertainment — says "there are no real games on laser yet; it is just a matter of reflexes and timing. No skill or strategy on the part of the player is involved."

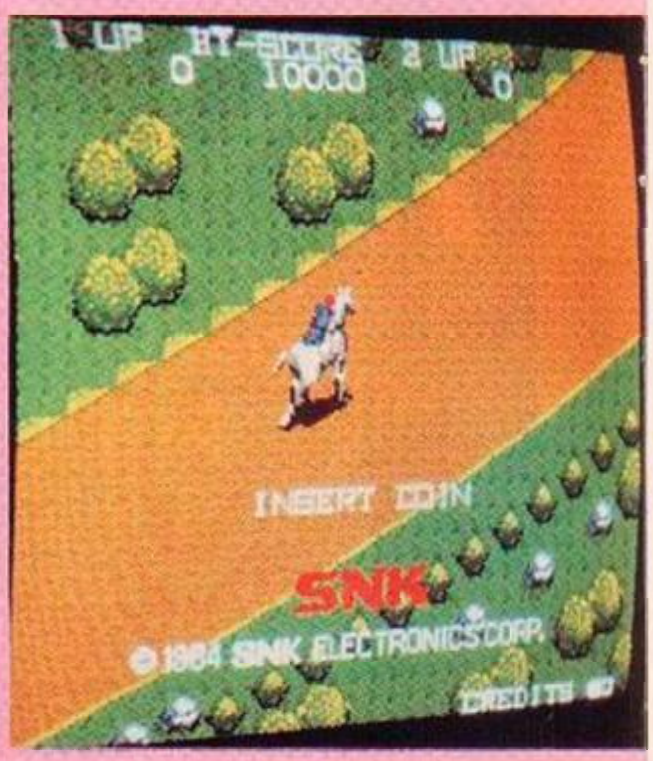
But then again Nintendo has no laser games of its own so perhaps its just sour grapes on his part.

It will be a long time if ever before home systems can hope to compete with rides like Doron's "swear-you-are-there" SR-2 which looks like a squashed minibus on hydraulic rams but is actually a sophisticated simulator designed for amusement parks and big arcades.

It was demonstrated for the first time in this country at the January 1985 Amusement Trades Exhibition International at Olympia. Up to a dozen people can take their seats in the SR-2 and when the doors close and the front screen lights up you soon lose any feeling that you are watching a film as the module you are in starts to tip and sway to complete the illusion of motion.

At the show a bunch of sober suited, cynical sales executives joined me for what was billed as a roller-coaster ride on the SR-2. Everyone was suitably impressed but unenthusiastic when the simulator tipped 45° backwards as the front view showed the first slope when the roller coaster was cranked up.

Then after reaching the top and starting the long descent the speed with which the



RCADES

hydraulic rams were able to tip us backwards and forwards and side to side as we went through the dips and bends shook everyone out of their complacency. When we hurtled into a shadow and out the other side to find ourselves flying free over a river there were 11 gasps and a cry of "Holy smoke" from an alarmed but polite middle-aged American.

Even more startling was the run down a bobsleigh track which followed it — now we could understand why they asked us to wear seatbelts as the cabin snaked from side to side through the icy bends, before emerging on a race track in severe danger of crashing into a Porsche.

This first SR-2 in this country will go to Bicton Park in Devon — there are already a few of an earlier model in places like Blackpool — but if you want one of your own I am afraid it will cost you £80,000 plus £1,200 for every new film and software module you order.

Money is the name of the game for arcade operators and Paul Moriarty of Taitel, one of the biggest distributors of machines in Britain, which originally brought Space Invaders to these shores has to decide which of the many games he is offered will be the winners. In a typical week he might get three different new arcade games, often from Japan, which come on interchangeable circuit boards or discs if they are for the lasers.

The boards are getting smaller all the time — the latest batch is notebook sized. All you have to do is slot one in and change the labels to turn your Pacman machine into Pac Lard. The TV screen is often on a turntable so you can convert the console to an upright game like Crown Golf in seconds.

He tries them out at a number of test sites — the list is secret and the places are rotated as a precaution against piracy. If the take is good, an exceptional new game can take as much as £80 a day on one machine. Then Taitel will buy up to 500 boards in one go, and at £500 to £700 a board that can be a lot of money.

Piracy poses the same sort of problems as elsewhere in the computer industry. In the early days the producers were naive about copying but now every board comes with a security chip — although it is only a matter of time before that is broken and then copies are produced by the thousand — often made in Taiwan. When the locations of test sites have leaked out, says Paul "it has been known for an employee of another firm to go in and rob the board."

At least laser-disc based games are much more difficult to copy by like many others in the business Paul still has his reservations about them. "They have to be made cheaper" he says and with price tags of £2,000 to £5,000 for a complete laser system compared with about £1,300 for its conventional equivalent you can see what he means.

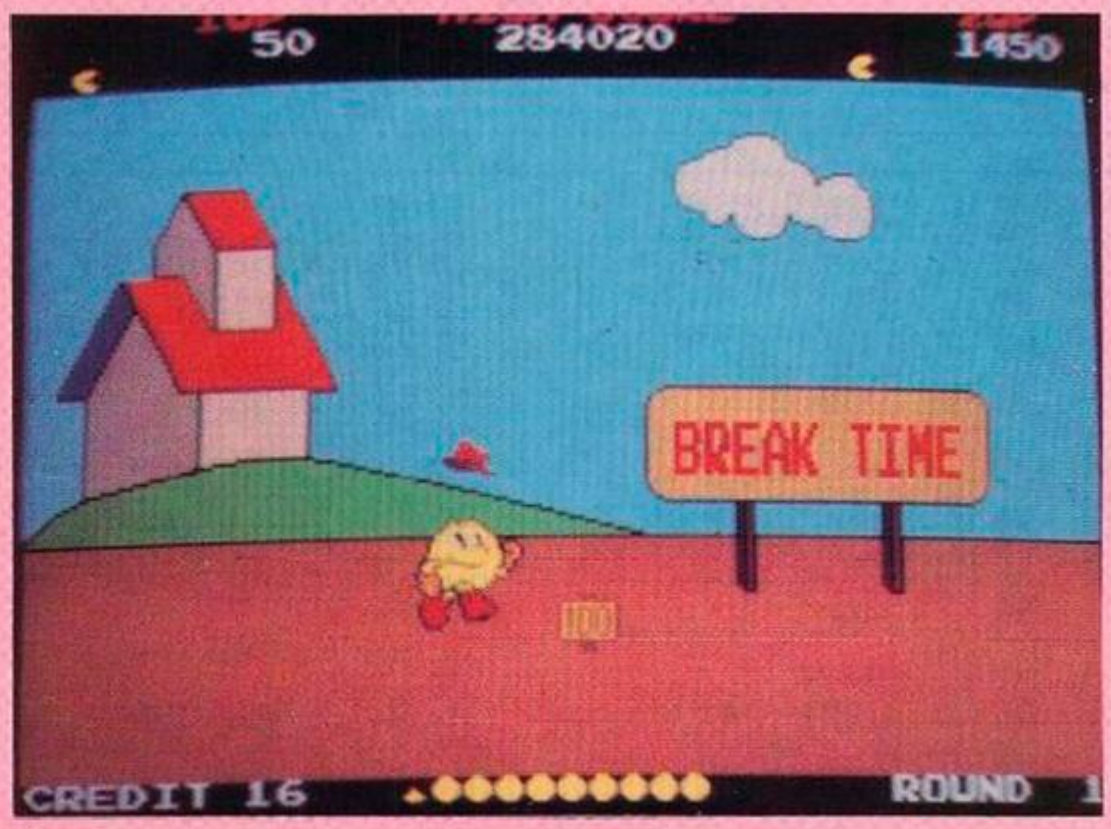
Machines are getting bigger — Sega's GP World has two TV screens, Atari's TX-1 three — but not necessarily better. Paul's own favourite game is still Qix which he thinks was ahead of its time "they should re-release it now" but he thinks that the newer "conventional games are getting as good as laser".

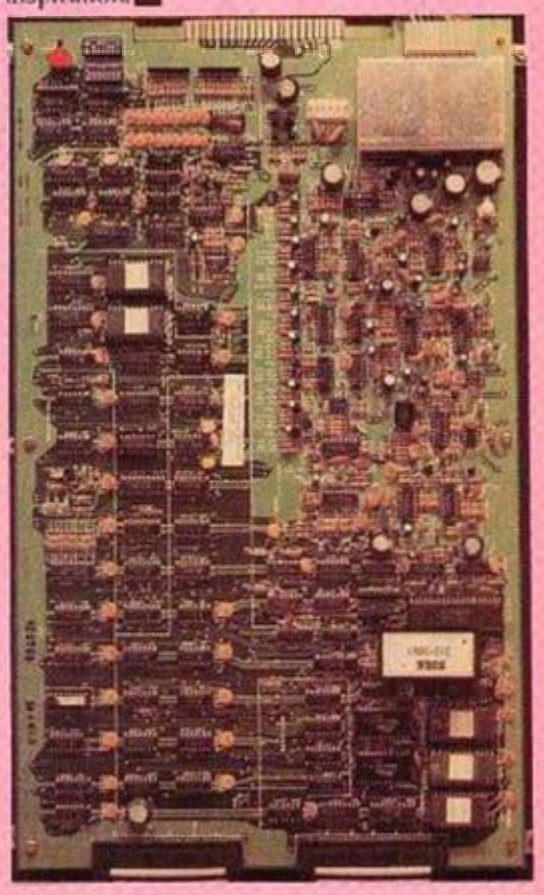
He can point to games like those shown on this spread — Pac Land with its cartoon quality graphics and Future Spy which takes the Zaxxon idea a whole step further. Gladiator, also shown, he is less enthusiastic about because despite some very good graphics in chariot racing sequences it is too much like the racing games which dominated 1984's Olympic summer



Games like Track and Field and Hyper Sports were astonishingly successful but they caused their own problems as consoles took a hammering from would be sprinters and long jumpers. Those companies that opted for the joystick rather than buttons to control what was happening on screen soon realised their mistake as the sticks took a year's wear in a couple of weeks. Sometimes the strain can be too much — in the case of Buck Rogers Taitel eventually had to fit £100 cast iron joysticks to take the punishment.

Many of the latest Japanese games stress individual combat — like Punch Out and Karate Champ II, while tie-ins with films such as Indiana Jones and the Temple of Doom and television series are still popular sources for inspiration. ■





PINBAT



WE HAVE TRIED to make a game that is different to traditional Pinball but which retains the feeling that skill and judgment, as well as a certain amount of luck, are all involved. Machine code is used for animation effects, score display and the bats, leaving all control of the "marble" in Basic, but using an array system to speed things up.

As with our other ZX-81 programs nearly everything is done by direct Poking and Peeking, to and from the ZX-81's character-mapped screen memory so everything in the game 'actually exists' on screen, not just as co-ordinates. Note that the Demo mode runs at about half speed.

It is possible for the marble to collide with any of 24 different types of object — left wall characters, right wall, gates, bats, etc. — and in most cases a different routine is needed to provide a suitable reaction, such as a bounce, a bonus, a special effect, etc. The most obvious approach is to use a series of If . . . Then checks to sort out which object the marble has hit and so which routine to call, but even in a fast Basic this would give an uneven response and a noticeably 'sticky' bounce of the marble.

Pinbat uses a more structured system, where the codes of the characters that the marble hits are read directly from off the screen and used to slice out individual elements from an array which in turn contains *pre-arranged* line numbers to Goto.

An example will make this clearer; Look at line 40; X is the marble's position onscreen, so X + DI — direction — is the marble's next intended position, and the Peek of this gives you the character that the marble is about to "hit".

Now assume that the marble has just hit a 'minus' character. The Sinclair Code for this character is 22, so the 22nd element of the array H gets selected and this contains the line number of the required routine to Goto in this case the "lost marble" routine at line 470. In this way the single line 40 can branch directly to all the necessary routines, most of which will then go back into the main loop.

Line 4280 specifies the line numbers associated with each of the characters that the marble could hit, and is a handy reference. In practice, all the array subscripts are shifted up by one — by line 4300 — because Sinclair arrays do not have a zero element.

A little extra planning-ahead is needed to initially fill up the Goto array with the correct line numbers, but the advantages are more than worth the trouble. The method is practically independent of the number of choices to be made, and so could be expanded even further without loss of speed, but at present only Sinclair Basic allows this particular type of computed Goto. In some ways it is more powerful than an On Goto command.

Note that the first element of the Goto array contains 10, so that when the marble is hitting Chr$ zeros — i.e. travelling through empty spaces — line 40 will Goto line 10 to continue the main loop. Also, as a safety precaution in case of typing errors, *all* those elements of the Goto array that correspond to unused characters have been given a default value of 460, so that if the marble hits something it shouldn't, say a score-digit character, then line 40 branches to line 460 which prints "error" and stops the program before the marble can plough on through addresses that

Disassembly.

```
4082 3A2140   LD   A,(4021)      4087 12F8   D,NZ  4054      40E9 56     LD   D,(HL)      4124 77     LD   (HL),A
4085 3D       DEC  A             4089 0D     DEC   C         40EA 2B     DEC  HL          4125 19     ADD  HL,DE
4086 2035     JR   NZ,4080       408A 20F6   JR    NZ,4082   40EB 5E     LD   E,(HL)      4126 7B0570 LD   (IY+70),
4088 3A2540   LD   A,(4025)      408C 79     LD    A,C       40EC 72     LD   (HL),D      4129 20F2   JR   NZ,4110
408B 3C       INC  A             408D 3A2540 LD    A,(4025)  40ED 23     INC  HL          412B 010000 LD   BC,0000
408C 20BA     JR   Z,4080        4090 FEFE   CP    FE        40EE 72     LD   (HL),E      412E CD8240 CALL 4082
408E 217D40   LD   HL,407D       4092 2008   JR    Z,40CC    40EF 2B     DEC  HL          4131 119CD4 LD   DE,D49C
4091 CD2240   CALL 4022          4094 FE7F   CP    7F        40F0 10F7   DJNZ 40E9        4134 1805   JR   413F
4094 010000   LD   BC,0000       4096 2818   JR    Z,40E0    40F2 48     LD   C,B        4136 111715 LD   DE,1517
4097 C9       RET                4098 010000 LD    BC,0000   40F3 C9     RET              4139 1803   JR   413F
4098 3E34     LD   A,34          409B C3     JP    NZ,40C40  40F4 216441 LD   HL,4164      413B 111110 LD   DE,1011
409A CDA940   CALL 40A9          409E 11D882 LD    DE,82D8   40F7 3E28   LD   A,28        413E 2A8C40 LD   HL,(408C)
409D 80       LD   D,B           40A1 10     DJNZ  40B3      40F9 19     ADD  HL,DE       4141 010600 LD   BC,0006
409E 3E01     LD   A,01          40A3 0618   LD    B,18      40FA 3D     DEC  A           4144 ED     LDIR
40A0 CDA940   CALL 40A9          40A5 23     INC   HL        40FB 20FC   JR   NZ,40F9      4146 01A001 LD   BC,01A0
40A3 78       LD   A,B           40A6 4F     LD    C,(HL)    40FD 0E1C   LD   C,1C        4149 09     ADD  HL,BC
40A4 B8       CP   B             40A7 23     INC   HL        40FF 06     LD   B,06        414A 2001   JR   NZ,414C
40A5 3825     JR   C,40CC        40A8 72     LD    (HL),D    4101 23     INC  HL          414C 73     LD   (HL),E
40A7 1837     JR   4080          40A9 2B     DEC   HL        4102 10FB   DJNZ 40FF        414D 2B     DEC  HL
40A9 2A8C40   LD   HL,(408C)     40AA 73     LD    (HL),E    4104 C9     RET              414E 2001   JR   NZ,4151
40AC 2B       DEC  HL            40AB 23     INC   HL        4105 1E2000 LD   E,0020       4150 75     LD   (HL),L
40AD 228C40   LD   (408C),HL     40AC 10F7   DJNZ  40A5      4108 0E22   LD   C,22        4151 23     INC  HL
40B0 09       ADD  HL,BC         40AE 4B     LD    C,B       410A 21D785 LD   HL,85D7      4152 0D     DEC  C
40B1 0E1C     LD   C,1C          40AF C9     RET             410D 7E     LD   A,(HL)      4153 FE     CP   A
4082 0621     LD   B,21          40B0 2A8C40 LD    HL,(408C) 410E FE76   CP   76          4154 00     NOP  B
4084 BE       CP   (HL)          40B3 11F0FF LD    DE,FFF0   4110 2803   JR   Z,4115      4155 61     LD   H,C
4085 C8       RET  Z             40B6 19     ADD   HL,DE     4112 00     LD   A,(BC)      4156 20F9   JR   NZ,4151
4086 23       INC  HL            40B7 0610   LD    B,10      4113 03     INC  BC          4158 C38240 JP   4082
```

```
   3 REM FIRST REM LINE CONTAINC
ANY 200 CHARACTERS (SEE TEXT)
   4 REM PINBAT/J.DAVE.ROGERS+
COLIN HOGG/JALTON,LIVERPOOL/1984
   5 RUN 4000
   6 REM -----CHANNELERS------)
   7 LET DI=33+SGN DI+USR 16699
   8 IF PEEK (X+DI) THEN LET DI=
-DI
   9 REM ------MAIN-LOOP------)
  10 POKE X+DI,82
  20 POKE X,0
  30 LET X=X+DI+USR 16514
  40 GOTO H(1+PEEK (X+DI))
  45 REM ----LINE 40 BRANCHES TO
ROUTINES FROM 0 TO 470 ACCORDING
TO CHR$ HIT(REFER TO LINES 4200-
ETC). ALL USR CALLS HAVE VALUE 0
  49 REM -----TRIBOOSTERS-----)
  50 LET DI=32
  55 POKE X-DI,136
  60 GOTO 100
  70 LET DI=34
  75 POKE X-DI,136
  80 GOTO 100
  90 LET DI=33
 100 PRINT AT 1,2;T$(.7+RND*2.7)
 110 GOTO 10+USR 16514
 120 REM ------DROPGATES------)
 130 POKE X+DI,137+(PEEK (X+DI)=
137)+USR 16514
 140 LET DI=32+1N( (RND*3)
 150 GOTO 40+USR 16514
 160 REM ------SIDEWALLS------)
 170 LET DI=DI+2-(33 AND DI=-1)
 180 GOTO 10
 190 LET DI=DI-2
 200 GOTO 10
 299 REM ------FLINGSTARS-----)
 200 POKE X,0
 210 LET X=X+DI
 220 POKE X,CODE "0"
 222 POKE X,CODE "0"
 224 POKE X,CODE "0"+USR 16F94
 230 LET DI=CODE "[illegible]CODE VAL
LEN "(.5+RND*9)-164
 240 POKE X,CODE "*"+USR 16514
 250 LET X=X+DI+USR 16638
 260 IF NOT PEEK X THEN GOTO 10
 270 LET X=X-(DI AND PEEK X)155)
 280 GOTO 220
 289 REM ------ROLLOVERS------)
 290 POKE X,USR 16000
 300 LET X=X-DI
 310 POKE X,(PEEK X)+1-(10 AND P
EEK X=155)
 320 POKE X+DI,82
 330 GOTO 30
 339 REM ---BATS---(▟ ▀ ▙)---
 340 LET DI=-34
 350 GOTO 10
 360 LET DI=-33
 370 GOTO 10
 380 LET DI=-32
 390 GOTO 10
 399 REM --------BONUS--------)
 400 PRINT AT 7,5;"WELL DONE.BON
US=";B;AT 7,5;
 402 FOR B=B TO B+5-1
 404 LET MC=USR 16638
 406 NEXT B
 408 PRINT "
 410 FOR N=X-133 TO X+34 STEP 33
 412 POKE N,137+RND
 414 POKE N+2,PEEK N
 416 NEXT N
 418 GOTO 10
 419 REM ------MISC-HITS------)
 420 LET DI=34+SGN DI
 430 GOTO 10
 440 PRINT AT 13,29;"[illegible]"
 450 GOTO 30
 460 PRINT AT 7,0;"UNSPECIFIED C
HARACTER HIT,CHECK PROGRAM";AT
 470 REM -----MARBLE-LOST-----)
 480 POKE X,0
 490 FOR N=1 TO 16
 491 POKE X+DI,CODE "X++-++X++--
+X++-"(N,
 492 NEXT N
 500 REM -----BAT5-SELECT-----)
 510 LET B$=("[illegible]" AND SN=2)+("
[illegible]" AND SN=5)+("[illegible]"
AND SN=6)
 520 IF B$="" THEN LET B$="▟▙"
```



Dave Rogers and Colin Hogg challenge you to become a pinball wizard on the ZX-81.

shouldn't be Poked!

This includes the ZX-81's dreaded Newline characters, lurking unseen down the side of the screen, the Poking of which invariably results in irretrievable crashes.

Something else that can't be seen onscreen is a "character 90" just above the launch channel. It is Poked there by line 670 — it can't be printed — and it is not seen because there is no bit-pattern for it in the ZX-81 Rom so it just looks like a space character, but it is used here as an invisible trigger. When the marble hits it then line 40 branches to line 440, printing a 'lid' over the launch channel to seal it off.

Line 230 looks odd, but it is the shortest way of selecting one of nine different directions at random, by using the Codes of various Chr$ sliced out of a string to yield values rather than doing calculations.

Note that when any of the machine-code sub-routines return to Basic their value is 0, so wherever you see "+USR" in the listing this is just a short way of calling a machine-code subroutine, it does not affect the numerical value of whatever calculation it was included in.

Usr 16514 Scrolls screen line 22 — columns 1 to 28 — sideways by one space, with wrap-around — this moves the various bats — *either* under Inkeys control when in play mode, or in response to an automatic routine when in Demo mode. All the other m-code subroutines return to Basic *via* this bat-move routine, thereby giving more continuous bat control.

Usr 16588/Usr 16608 (Separate entry points into the above routine). Scrolls line 22 left/right respectively. This is done simply by swapping adjacent *pairs* of display file bytes and then moving in sideways increments of one, repeating 28 times in all. Wraparound is achieved automatically when using this method since after a complete line of swaps the line itself will have moved one way but the end character will have been 'bucket-brigaded' across to the opposite end — work it out!

The "autobat" routine starts at 16536. It scans the screen to find the bat and the marble, works out their relative column positions and then calls whichever of the above scroll routines is needed to move the bat to catch the marble.

Usr 16694 Scans the screen (lines 4 to 16) for "asterisk" and "plus" characters, and wherever one is found swaps it for the other giving an animation effect. The next time it is called it will swap the characters back to their originals.

Usr 16689 As above, but scans for left and right brackets characters.

Usr 16699 Same again, but for characters whose Codes are held in addresses 16690 and 16691 i.e., redefinable by Poking those addresses.

Usr 16638 Adds one to the score (which is held in a permanent store area, see below) then copies this into the screen.

Usr 16652 Copies the score onto the screen but without adding anything to it.

Poke 16660 Spacing between digits when score is copied onto the screen.

16734 to 16740 Score store area. Before each game, lines 860-880 in the Basic reset these bytes to "zero" characters.

First enter 'Fast' mode then type in, as line one, Rem plus exactly 230 of any characters. Now type in the whole listing and, *resisting* the temptation to Run it straight away, Save and label two backup copies!!

When first Run, the machine code gets Poked into the Rem and is sum-checked as it goes in. Having corrected any errors, as indicated, and checked that the program works, you can then erase all lines from 7000 onwards and Save a few working copies using the Autosave (goto 3000). Always Clear before Saving otherwise you will Save the array on tape, making loading unnecessarily long — the array — is 1k in actual size, since each number = 5 bytes — also select "slow" mode.

Please check carefully the following lines — "gas" indicates characters obtains using graphic mode and Shift: All greys are gsH.

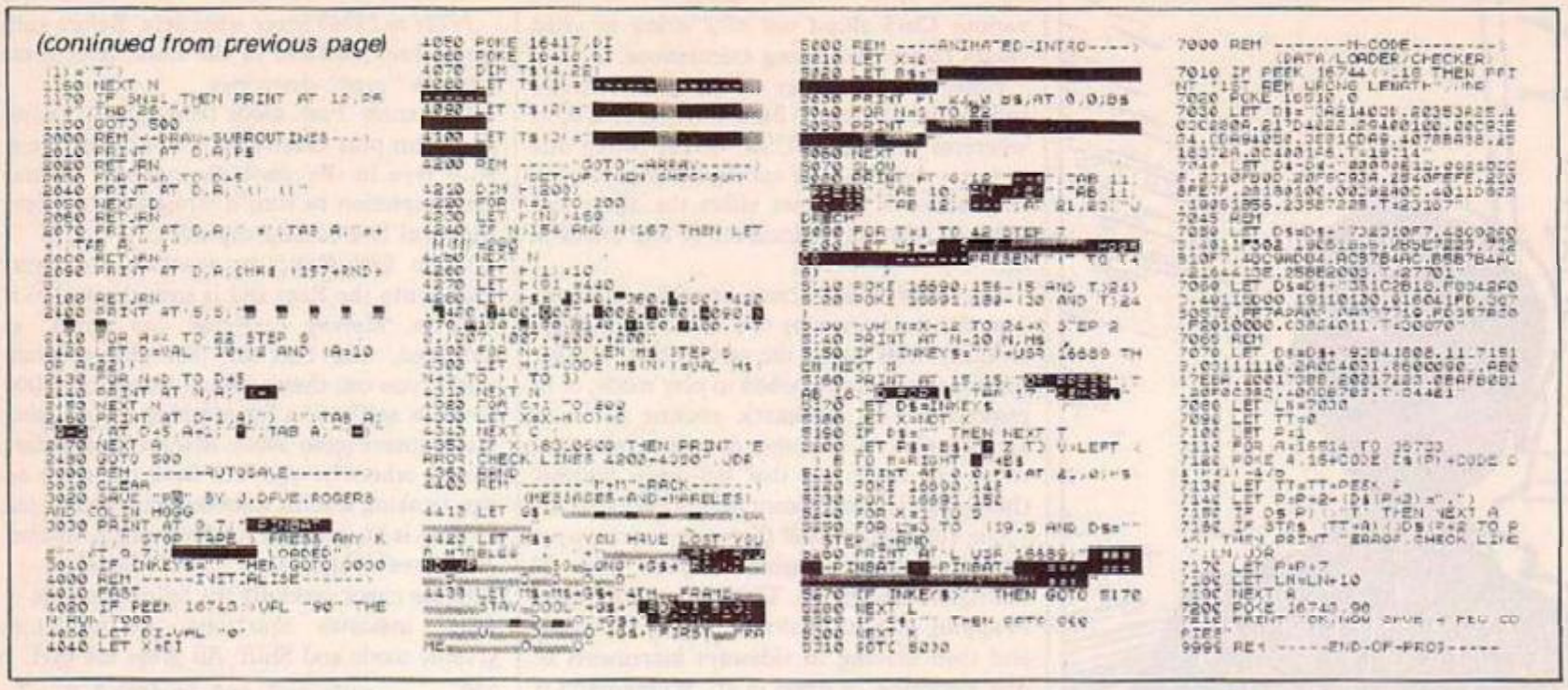
230	gsW, gsA, gs6 inverse 7, 8, 9, keywords Code, Val, Len. *No* extra spaces.
960	inverse right bracket, 30 spaces, inverse left bracket.
970	inverse left bracket (gsl). 980 gs2, gsR, gsH, gsW, gs4.
2460	(all inverse) Q, –, Q. Second string, Y.
4260	(This line is so important it is checksummed). gsQ, gs7, gsW, gs2, gsR, inverse Y, inverse Q, inverse space, gsN, gsJ, gsM, gsF, gsG, gsH, gs0, gsl (rest are normal characters).
1010	gsF, gsJ and inverse zeros are used.
2040	one space between the brackets.
4090-4100	gsN and gsM are used.
4410-4430	gsD and gs6 are used. Type exactly as shown, some words 'contain' marbles for use on their screen.
5110	2 inverse spaces, inverse 0, 2 inverse spaces, inverse 0, Inverse space, 7* gsF, inverse space, inverse 'hogrog', 7* inverse spaces, gsJ's and gs B's.
440	inverse left bracket, 2 inverse spaces.

When playing, use two fingers of one hand

(continued on next page)

```
AND NOT DEM)+("▙▟" AND DEM)
 530 PRINT                  AT 21,0;"
█                              █ █
▒------------------------------▒ ▒
▒";TAB 31;"▒";AT 22,14;B$
 600 REM -----NEW-MARBLE------)
 610 LET D$=-33
 620 LET X=VAL "790+PEEK 16396+2
56*PEEK 16397+USR 16652"
 630 LET M=M-1
 640 PRINT AT 23,1;M$(M-29 TO M)
 650 IF M$(M)="*" THEN GOTO 700
 660 IF M$(M)<>"O" THEN GOTO 630
 670 POKE X-363,90
 680 POKE X,CODE "OCEO"(4-RND*3)
 690 IF INKEY$="" AND NOT DEM TH
EN GOTO 680
 692 FOR N=1 TO 15 STEP 3
 694 PRINT AT 13,29;"█U █U █U █
U  U"(N TO )( TO 3)
 696 NEXT N
 698 GOTO 100
 700 REM ------NOW-WHAT?------)
NEW-SCREEN/GAMEOVER/RESTART/DEMO
 710 IF SN<6 THEN GOTO 900
 720 IF DEM THEN GOTO 800
 730 PRINT AT 13,2;"P TO PLAY AG
AIN/D FOR DEMO";AT 22,13;"GAME
OVER"
 740 POKE 16691,USR 16588+USR
     16689+USR 16699+USR 16694
 750 POKE 16690,(8 AND RND>RND)
 760 LET D$=INKEY$
 770 IF D$<>"D" AND D$<>"P" THEN
GOTO 740
 800 LET DEM=(D$="D")
 810 POKE 16417,DEM
 820 IF DEM THEN PRINT AT 22,1;
" DEMO MODE ANY KEY TO ESCAPE "
 830 LET SN=0
 840 LET M=LEN M$+1
 850 LET B=40
 860 FOR Z=16734 TO 16740
 870 POKE Z,CODE "0"
 880 NEXT Z
 900 REM ---DRAW-EMPTY-TABLE---)
 910 LET SN=SN+1
 920 PRINT                  AT 0,0;"
██████████████████████████SCORE█
▒"+T$(1+RND+RND)+"▒▒▒▒▒▒▒▒▒█
 930 LET ANG=VAL "1+(33 AND (SN=
1 OR SN=3 OR SN=4))"
 940 POKE 16660,ANG
 950 FOR N=2 TO 20
 960 LET P$="█
               █"
 970 IF N>13 THEN LET P$(30)="█"
 980 IF N<9 THEN IF ANG=34 THEN
LET P$(23+N TO 31)="▀▙▄"
 990 PRINT P$
 991 NEXT N
 992 IF ANG=1 THEN PRINT AT 2,25
;"▒/////";TAB 25;"▒▒▒▒▒▒";TAB 30
;"▜"
1000 REM ----SCREENS-DATA-----)
1010 LET P$=("▖ ▘" AND (SN=1 OR
 SN=4))+("(▒00▒)  (▒00▒)" AND (SN
=2)+("+▒--+▒-" AND SN=5)+("0▒0▒0
" AND SN=6)
1020 LET S$="C1008.C1018.T1110.T
1310.T1120.T1320.T1115.T1315.F05
03.F1203.P0609.P0514.P0811.P0620
.F0925"
1030 IF SN=2 THEN LET S$="P0604+
P0612+F0903+P1003+F0325+P1404+P1
412"
1040 IF SN=3 THEN GOTO 2400
1050 IF SN=4 THEN LET S$="F0404/
P1105/F0414/P0509/F1324/C0913/C0
610/C1116/C0903/T0813/T1108/T151
0/T1115/T1518/T0721"
1060 IF SN=5 THEN LET S$="R0504:
00516:G0905:E0917:R1308:S1318"
1070 IF SN=6 THEN LET S$="P0703,
P0721,P0725,F1304,F1316,C0503,C0
515,C1009,C1021"
1100 REM -----DRAW-SYSTEM-----)
1110 FOR N=1 TO LEN S$ STEP 6
1120 LET X$=S$(N TO )
1130 LET D=VAL X$(2 TO 3)
1140 LET F=VAL X$(4 TO 5)
1150 GOSUB 2000+(30 AND X$(1)="C
")+(70 AND X$(1)="F")+(90 AND X$
```

(continued on next page)



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rather than two hands, it's much easier to control the bats. The wraparound can sometimes be used to advantage to quickly reach marbles on the opposite side of the screen. You score points by hitting stars or rollover targets — inverse numerals.

At sidewalls the marble obeys simple laws of reflection, but at stars or grey blocks the marble gets thrown off at a *random* angle. At "triboosters" the marble is deflected whichever way the tribooster characters are pointing at the time, and then a new tribooster, of random type, gets printed, this being essential to prevent the marble from ever getting stuck in an infinitely recurring pattern of bounces.

Physicists may like to note that with few exceptions marble motion is assumed to be Newtonian, frictionless, perfectly elastic and in zero gravity(!).

Main variables.

H(N)	'On Hit Goto' array.
X	Position of marble on screen (start of display file plus an offset).
DI	Direction of marble — 1 = right, 33 = down, etc.
M$	Messages and Marbles Rack
M	Pointer, keeping track of progress along M$.
B$	Bats.
SN	Screen number.
DEM	Demo mode if set to one, Play mode if zero.
D$	Demo select, input by player.
ANG	Angle of score display.
P$	Printing strings.
S$	Screen storage strings
D, A	Down/Across printing co-ordinates.
JDR	Undefined variable to stop program on errors.

Taped copies of this program are available for £2.50 from:

11 Carnarvon Road, Walton, Liverpool, L9 1EB. The cassette also includes two of our other ZX-81 games.

Line-by-line.

7	New direction is 33 or −33 to 'channel' marble straight up or down.
8	Reverses the newly picked direction if the case of the marble hitting the channeller directly from underneath.
10-40	Main loop. Line 40 is particularly efficient (see text).
50-110	Triboosters. Three entry points for three different tribooster directions, but all return via 110 which prints a new tribooster of random type over the old one.
130-150	Dropgates. 130 swaps characters 137 and 138 to animate gate.
160-190	Sidewalls. Simple laws of reflection are obeyed e.g., at left wall, if collision is in south-west direction then DI = 32, rebound is south-east with DI equal to 34.
200-280	Flingers. Marble is thrown off at any of eight directions. To choose these at random a string is sliced which contains characters that will yield the required numbers — after 164 removed from them.
260	If chosen direction takes marble into a clear space then go back to main loop, if not, then stay in flinger routine until a clear route is chosen.
290-330	Rollover targets. Line 310 peeks the character and adds one to it thus incrementing the rollover number each time marble passes over it. The bracketed function resets nines to zeros.
420-430	This caters for the occasions when the marble hits the edge of the score display, causing the marble to run diagonally across it.
340-390	Bounces off bat. Bats are made from three different characters, each causing the marble to bounce off at a different angle.
400-418	Bonus routine.
460	Stops the program if marble hits an unspecified character, this especially protects against 'rewlines' being poked and causing a crash. Program is routed to this line because all unspecified elements of the Goto array are filled with value 460.
440-450	Prints "lid" over launch channel when marble hits the — invisible — character 90 present onscreen just above the channel.
470-492	Marble lost. "Twinkles" marble where it hit the baseline.
600-620	Start new marble.
630-660	Moves the string M$, which contains "messages and marbles" across the bottom of the screen until either a marble character is detected whereupon the 'ready to launch' routine at 680-690 operates or a fullstop character is detected, which is used as a trigger for jumping to the "next screen" routine.
692-696	Slides a gate open at top of launch tube.
700-800	Miscellaneous decisions.
730-770	Game-over routine. Calls all the animation scans at once, until player decides to play again or go into demo mode.
800-820	Demo decisions.
860-880	Pokes "score store" bytes to character zeros.
900-992	Draws over and thereby erases old screen with a new one.
1000-1070	Select different strings containing draw instructions for screens 1-6
1100-1160	Extracts print co-ordinates from strings and passes these to draw subroutines.
2000-2480	Draw routines: 2010 draws whatever is in P$, 2030 draws a "channeller", 2060 draws a "rollover target", at 2400 there is a separate routine to draw all of screen 3 — bonus screen.
3000-END	Autosave /Initialisation/ presentation screen/machine code data, and loader. ■

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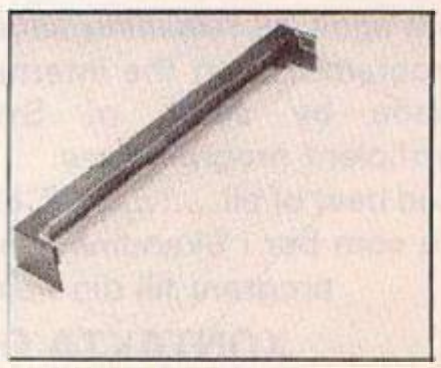
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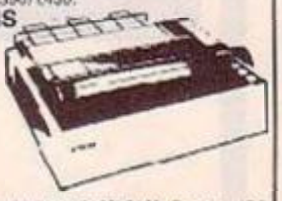
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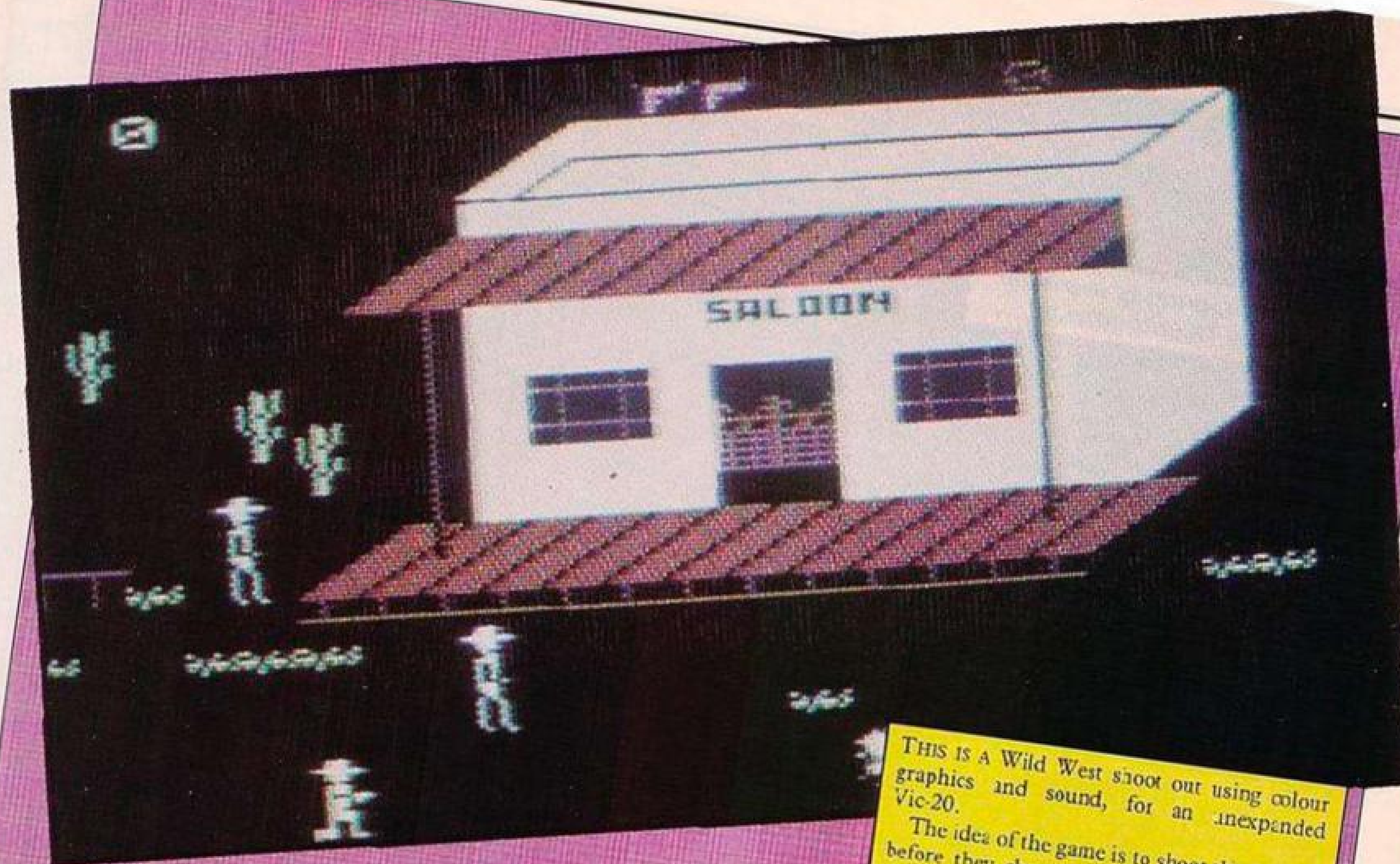
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VIC GUN FIGHT

THIS IS A Wild West shoot out using colour graphics and sound, for an unexpanded Vic-20.

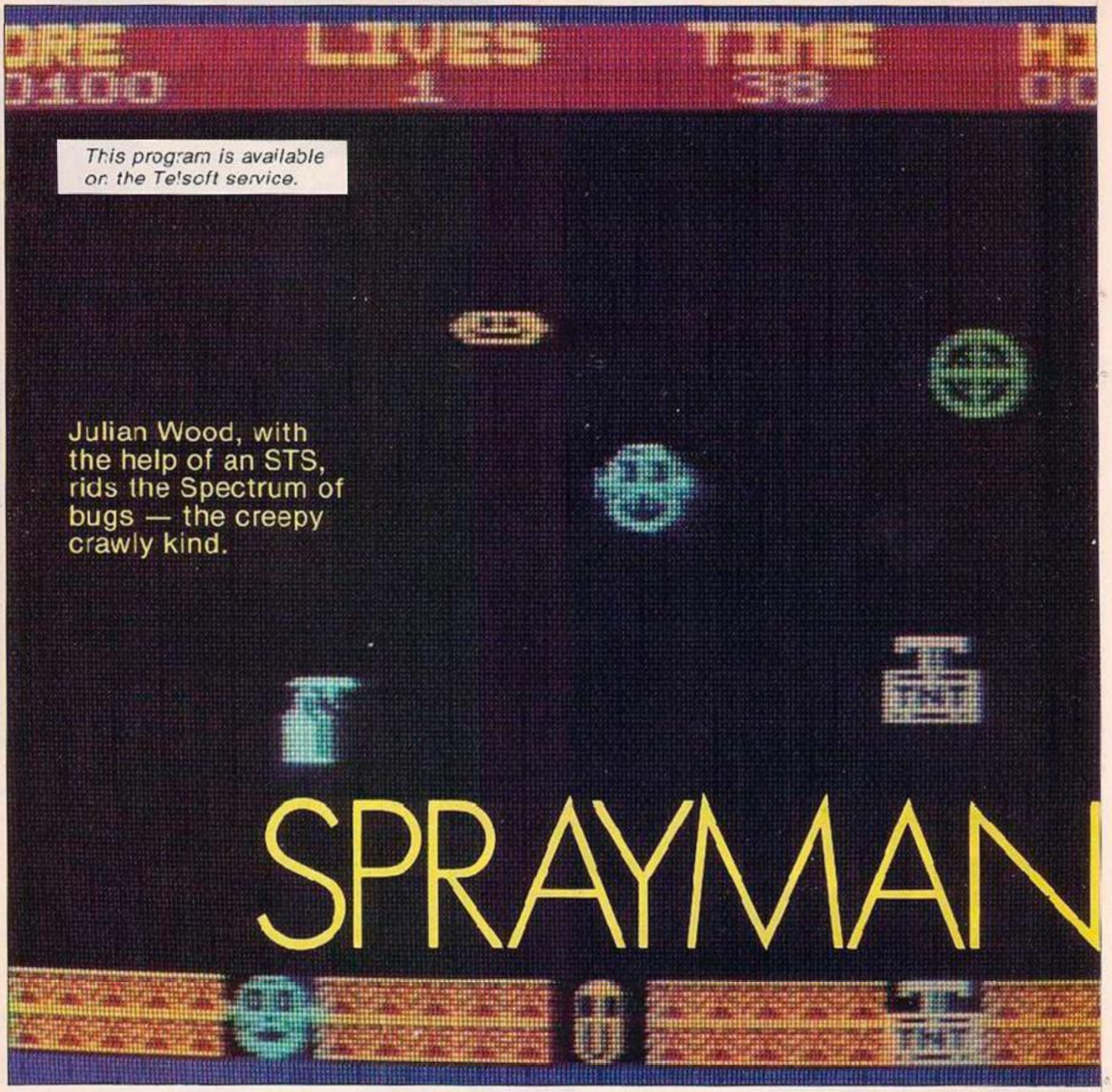
The idea of the game is to shoot the outlaws before they shoot you. Points are given for each one you shoot, the faster your reactions, the more points you receive. You will lose points if you shoot the moving unarmed man. Use any key to shoot, beware of the snake!

Program 1.

```
1 REM*****GUNFIGHT*****
2 REM*******BY*******
3 REM JAMES SULLIVAN
4 REM****************
5 POKE36879,8 PRINTCHR$(142)"[illegible]
10 PRINT" SHOOT THE OUTLAWS BEFORE THEY SHOOT YOU"
15 PRINT" POINTS WILL BE GIVEN FOR EACH ONE YOU SHOOT"
20 PRINT" THE FASTER YOU REACT THE MORE POINTS YOU WILL RECIEVE"
25 PRINT" POINTS WILL BE LOST IF UN-ARMED MOVING MANS SHOT"
30 PRINT" YOU HAVE 3 LIVES"
35 PRINT" USE ANY KEY TO FIRE"
40 PRINT" BEWARE OF SNAKE!!!"
45 PRINT"[illegible]
46 POKE52,28:POKE56,28:FORX=7168TO7679:READX:POKEN,X:NEXT
49 FORT=1TO2000:NEXT:PRINT"[illegible] LOAD GAME"
50 DATA28,28,127,28,28,8,28,28,28,28,28,28,36,28,28,28,12,12,12,12,12,12,12,18
52 DATA1,1,7,1,1,0,0,1,192,192,240,192,192,128,192,192,1,1,1,1,1,2,1,1,1
54 DATA64,64,64,64,64,64,192,192,1,1,2,2,2,2,2,2,4,64,64,64,64,64,64,64,31,64
56 DATA28,28,28,28,18,28,28,28,24,24,24,24,24,24,24,28,64,64,64,64,32,192,192,19
58 DATA64,32,32,32,32,32,32,144,0,0,0,0,0,0,28,28,127,28,28,8,28,28,28,92,28
60 DATA12,60,60,36,36,39,103,1,0,0,0,0,0,56,56,254,56,56,16,56,56,31,28,56
62 DATA48,60,60,36,36,225,239,128,0,0,0,0,0,48,112,240,120,120,80,4,10,118,46
64 DATA14,28,28,28,12,16,10,22,0,28,56,28,124,60,126,139,15,62,14,28,24,31,31,1
66 DATA0,2,48,56,123,19,193,215,0,0,0,3,96,255,255,253,36,28,31,39,67,43,112,40
68 DATA2,1,2,120,65,12,124,252,128,1,1,1,1,1,1,1,0,0,0,0,0,255,255,19,0
70 DATA0,10,7,119,223,190,189,65,0,224,231,243,247,255,255,255,0,0,0,0,0,0,0,0,0
72 DATA0,255,190,159,131,159,199,207,0,0,0,0,0,0,0,0,247,231,249,255,255,255,255,255
74 DATA56,36,16,56,40,32,60,56,28,156,72,124,36,20,28,28,20,28,20,20,20,12,60,92
76 DATA6,12,8,6,1,129,90,60,1,2,2,2,1,129,66,60,12,12,12,12,60,109,76,156
78 DATA6,12,8,6,1,65,80,60,16,16,16,16,255,0,0,0,0,0,0,197,82,221,178,32
80 DATA18,26,26,90,90,84,90,88,90,42,26,28,24,24,24,24,239,239,239,239,239,239,2
82 DATA255,255,17,117,21,209,21,255,255,255,113,117,117,17,17,255
84 DATA255,255,19,82,84,86,22,255,129,193,163,149,255,153,153,255
86 DATA165,255,165,255,165,255,165,255,255,254,252,240,240,224,192,128
88 DATA1,3,7,15,31,63,127,255,255,255,255,255,255,255,255,255
90 DATA0,255,255,255,255,255,255,254,254,253,251,247,239,223,191,127
92 DATA223,239,255,221,239,207,175,111,0,255,251,247,239,223,191,127
94 DATA0,0,0,255,0,0,0,0,130,104,126,104,112,96,96,0
96 DATA0,16,16,16,16,16,16,16,16,0,0,0,0,0,0,0,255
```

Program 2.

```
5 PRINT"[illegible] POKE36879,8
8 V=36878 [illegible]
15 [illegible]
20 PRINT"[illegible]
25 PRINT"[illegible]
30 PRINT"[illegible]
35 PRINT"[illegible]
40 PRINT"[illegible]
45 PRINT"[illegible]
50 PRINT"[illegible]
55 PRINT"[illegible]
60 PRINT"[illegible]
70 POKEV,5:FORX=0TO9:IFRND(1)>.5THEN[illegible]
75 PRINTTAB(X)[illegible]
80 FORT=1TO30:NEXT:PRINT[illegible]:POKES,230:POKES,0
85 POKES,230:POKES,0:[illegible]:NEXT:PRINTTAB(197)X$
90 PRINT[illegible]
95 FORT=1TO[illegible]RND(1):NEXT
100 ON[illegible]RND(1)GOTO105,145,145,175,175,180,180,195,195,205,205,23
105 TB=207:[illegible]
110 IF[illegible]THEN120
115 PRINTTAB(TB)"[illegible]":FORT=1TO30:NEXT:PRINT"[illegible]
120 PRINTTAB(BT)"[illegible]":FORT=1TO200:NEXT:PRINT"[illegible]":GOTO120
125 PRINT"[illegible]:POKE7889+L,32
130 POKEV,2:POKES,130:FORT=1TO50:NEXT:POKES,0
135 FORT=1TO1000:NEXT:FORN=1TO23:POKE781,N:SYS60004:NEXT:POKE198,0
140 GOTO70
145 B$="[illegible]":TB=9:N1=8024:N2=8116:P=23
150 BT=217:F$=[illegible]:C$="[illegible]"
155 IFRND(1)>.5THENTB=15:N1=8049:N2=8094:P=45
160 GOSUB260
165 IFP>0THEN120
173 GOTO90
175 B$="[illegible]":TB=12:N1=8025:N2=8094:P=23
178 GOTO165
180 B$="[illegible]":TB=47:N1=8060:N2=8116:P=49
185 IFRND(1)>.5THENTB=37:N1=8065:N2=8115:P=25
190 BT=217:F$=F1$:C$=[illegible]:GOSUB260:GOTO165
195 B$="[illegible]":TB=18:N1=8025:N2=8094:P=23:BT=217:F$="[illegible]":C$="[illegible]":GOSUB26
200 GOSUB260:GOTO165
205 IFPEEK(197)<>64THEN220
210 FORT=1TO[illegible]
215 PRINT"[illegible]":SC=SC-2:NEXT
220 PRINTTAB(230)"[illegible]":IFPEEK(197)<>64THEN225
225 PRINT"[illegible]":POKEV,15:POKES,150:SC=SC+100-T:FORT=1TO40:NEXT:POKES,0:PRINT"[illegible]
230 TB=2.7:N1=8115:N2=8055:P=25:C$="[illegible]":BT=217:GOTO120
235 FORN=1TO[illegible]
237 FORT=1TO10:IFPEEK(197)<>64THENGOSUB255
240 NEXT:PRINTTAB(T)"[illegible]":POKES,230:POKES,0
245 NEXTT,N:FORN=1TO2:PRINTTAB(142-N)"[illegible]":POKES,230:POKES,0:FORT=1TO10:IFPEEK(197)<>64THENGOSU
250 PRINT"[illegible]":POKES,200:POKES,0:FORT=1TO115:NEXT:N:PRINT"[illegible]":GOTO95
255 PRINTTAB(TB)F$:SC=SC-200:GOSUB275:FORT=1TO30:NEXT:RETURN
260 PRINTTAB(TB)B$:IFPEEK(197)<>64THEN275
265 FORT=1TO[illegible]:IFPEEK(197)<>64THENPRINTTAB(BT)F$:N=N1:N1=N2:N2=N3:P=P:SC=SC+
268 100-T:T=L
270 NEXT
275 POKEV,15:POKES,160:FORT=1TO10:NEXT:POKES,0
280 FORN=1TO25STEP:POKEN1,34:FORT=1TO12:NEXT:POKEN1,32:NEXT:PRINTTAB(TB)C$
285 IFSC<0THENSC=0
290 PRINT"[illegible]":SC:TL=TL-1:RETURN
295 IFHS<SCTHENHS=SC
300 PRINTTAB(28)"[illegible] ANY KEY":POKE198,0
305 GET A$:IFA$=""THEN305
310 GOTO10
```



This program is available on the Telsoft service.

Julian Wood, with the help of an STS, rids the Spectrum of bugs — the creepy crawly kind.

SOMETHING I'VE always wanted is my very own Spray Test Simulator or STS. Having waiting for over two years for one to be released on the Spectrum, I decided to write one myself..

This particular STS is equipped with three different sprays designed to eliminate three different types of creature, plus another spray which disintegrates TNT. Your aim is to give these sprays the fair test they deserve. Your score will indicate whether you have the skill to become a professional STS operator — a score of a million is just about good enough! Spraymania runs on any ZX-Spectrum, and features smooth, colourful animated graphics and a lot of sound.

To enter Spraymania, first type in the Basic header program in listing 1, and save it using:

SAVE "SPRAYMANIA" LINE 0

In case you were wondering the

RANDOMIZE 51707

statement is essential. Also, the Border 1 statement is important.

Then type in the machine-code loader program in listing 3 and Run it. Enter each byte as shown in listing 2, taking care to check the checksum after entering each line. If you make a mistake in a line, enter 999, and a beep will sound, and you can enter that line again. If you enter a byte which is obviously wrong (less than 0 or greater than 255 — another tone will sound, and you can then enter the correct byte. When you have entered all the machine-code, and the checksum is correct, save the code after the leader program, using

SAVE "C" CODE 25000, 3400

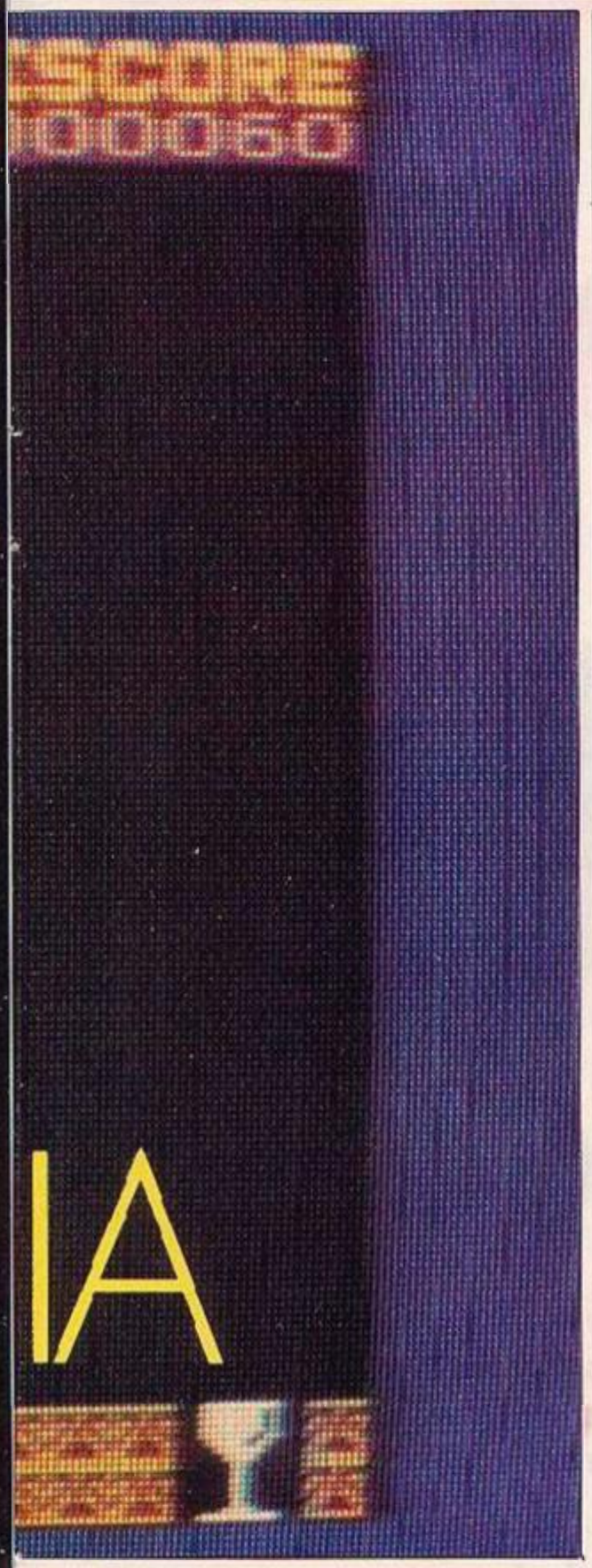
Rewind the cassette and load the game.

On running, the program goes into demo mode, during which brief instructions — including the control keys — scroll smoothly across the screen. On pressing a key, the game starts with your spray-can appearing at the centre of the screen. At the bottom of the screen are the various sprays, and a bonus box in which the bonus appears every so often. To collect a spray, or the bonus, simply move your can over the relevant box.

- Whirlers (bounce around the screen like balls) = 50
- Gruesomes (vertically-moving faces) = 10
- Globules (move horizontally) = 25
- TNT = 100
- Bonus = 250

Unlike the moving creatures the TNT doesn't kill on touch but gradually changes colour until it becomes white and explodes.

For a copy of Spraymania on cassette, send a cheque or postal order for £1.90, to: Mr J.R Wood, 22 Derver Hill, Downham Market, Norfolk, PE38 9BE.



Listing 1.

```
  10>PAPER 1: INK 1: BORDER 1: C
LEAR 24999: PRINT AT 11,5; FLASH
 1; PAPER 7;"SPRAYMANIA IS LOAD1
NG": LOAD ""CODE : RANDOMIZE 517
07: PRINT USR 28187
```

Listing 2.

```
25000: 007CC6C6C6C67C00 = 1040
25008: 001838781818FF00 = 502
25016: 007CC6067CC0FE00 = 834
25024: 007CC63C06C67C00 = 582
25032: 00C0D3D0FE181800 = 926
25040: 00FEC0FC06C67C00 = 962
25048: 007CC0FCC6C67C00 = 1088
25056: 00FE060C18303000 = 392
25064: 007CC67CC6C67C00 = 966
25072: 007CC6C67E067C00 = 776
25080: 7CFEC6C6FEFEC6C6 = 1678
25088: FCFEC6FCFEC6FEFC = 1914
25096: 7CFEC6C0C0C6FE7C = 1536
25104: F8FCCEC6C6CEFCF8 = 1808
25112: FEFEC0FCFCC0FEFE = 1904
25120: FEFEC0FCFCC0C0C0 = 1780
25128: 7CFEC0DEDEC6FE7C = 1590
25136: C6C6C6FEFEC6C6C6 = 1696
25144: FEFE1818181818FEFE = 1112
25152: FEFE181818D8F870 = 1156
25160: C6CCD8F0F0D8CCC6 = 1716
25168: C0C0C0C0C0C0FEFE = 1660
25176: C6EEFED6C6C6C6C6 = 1696
25184: C6E6F6FEFEDECEC6 = 1808
25192: 7CFEC6C6C6C6C6FE7C = 1548
25200: FCFEC6FEFCC0C0C0 = 1786
25208: 7CFEC6D6DECEFE7C = 1596
25216: FCFEC6FEFCD8CCC6 = 1828
25224: 7CFEC0FC7E06FE7C = 1332
25232: FEFE1818181818181818 = 652
25240: C6C6C6C6C6C6FE7C = 1566
25248: C6C6C6C6C66C3810 = 1170
25256: C6C6C6D6D6D6FE6C = 1598
25264: 82C66C38386CC682 = 984
25272: 6666667E3C181818 = 564
25280: FEFE0E1C3870FEFE = 1226
25288: 3030301800C000000 = 180
25296: 0C0C0C1830000000 = 108
25304: 383838000038383838 = 336
25312: 7E81EDB1B1BD817E = 1242
25320: 000000000C0C1830 = 96
25328: 0000000000000000 = 0
25336: FF886BD5B663C1FF = 1440
25344: 0000183C3C180000 = 168
25352: 07E01FF83DBC718E = 1014
25360: 63C6E5A7C993FFFF = 1551
25368: FFFFC993E5A763C6 = 1551
25376: 718E3DBC1FF807E0 = 1014
25384: 07E01FF83C7C706E = 915
25392: 63C6F4E7FED3CF93 = 1591
25400: C9F3CB7FE72F63C6 = 1349
25408: 760E3E3C1FF807E0 = 764
25416: 07E01FF83C3C781E = 780
25424: 7FFEEE77CFF3CBD3 = 1602
25432: CBD3CFF3EE777FFE = 1602
25440: 781E3C3C1FF807E0 = 780
25448: 07E01FF83E3C760E = 764
25456: 63C6E72FCB7FC9F3 = 1349
25464: CF93FFD3F4F763C6 = 1591
25472: 706E3C7C1FF807E0 = 916
25480: 07E00CF01FF8318C = 951
25488: B9CDB9CDF18FFFFF = 1674
25496: B7EDAE753A5C324C = 987
25504: 381C1C380FF003C0 = 618
25512: 07C00C701FF0310C = 825
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26328: 0F1D2A2A2A1E1317 = 242
26336: 0F2A2A2A12131D0D = 220
26344: 191C0F00251D1A1C = 188
```

(continued on page 65)

Listing 3.

```
  5 REM  SPECTRUM hex loader
 10 DEF FN h(hs,hl)=(CODE hs(1)
-48-(7 AND hs(1)>"9")+CODE hs(2
)-48-(7 AND hs(2)>"9"))
 20 INPUT "start ";s
 30 INPUT "finish ";f
 40 FOR n=s TO f STEP 8
 50 LET tot=0
 60 PRINT n;" ";
 70 INPUT hs: PRINT hs;
 80 FOR b=1 TO LEN hs-1 STEP 2
 90 LET tot=FN h(hs,b): LET tot=t
ot+
100 POKE n+b/2,
110 LET hs=hs(3 TO )
120 NEXT b
130 PRINT " = "; INPUT t: PRIN
T t
140 IF tot<>t THEN PRINT "input
error - try again": GO TO 60
150 NEXT n
160 REM Enter STOP to stop
```

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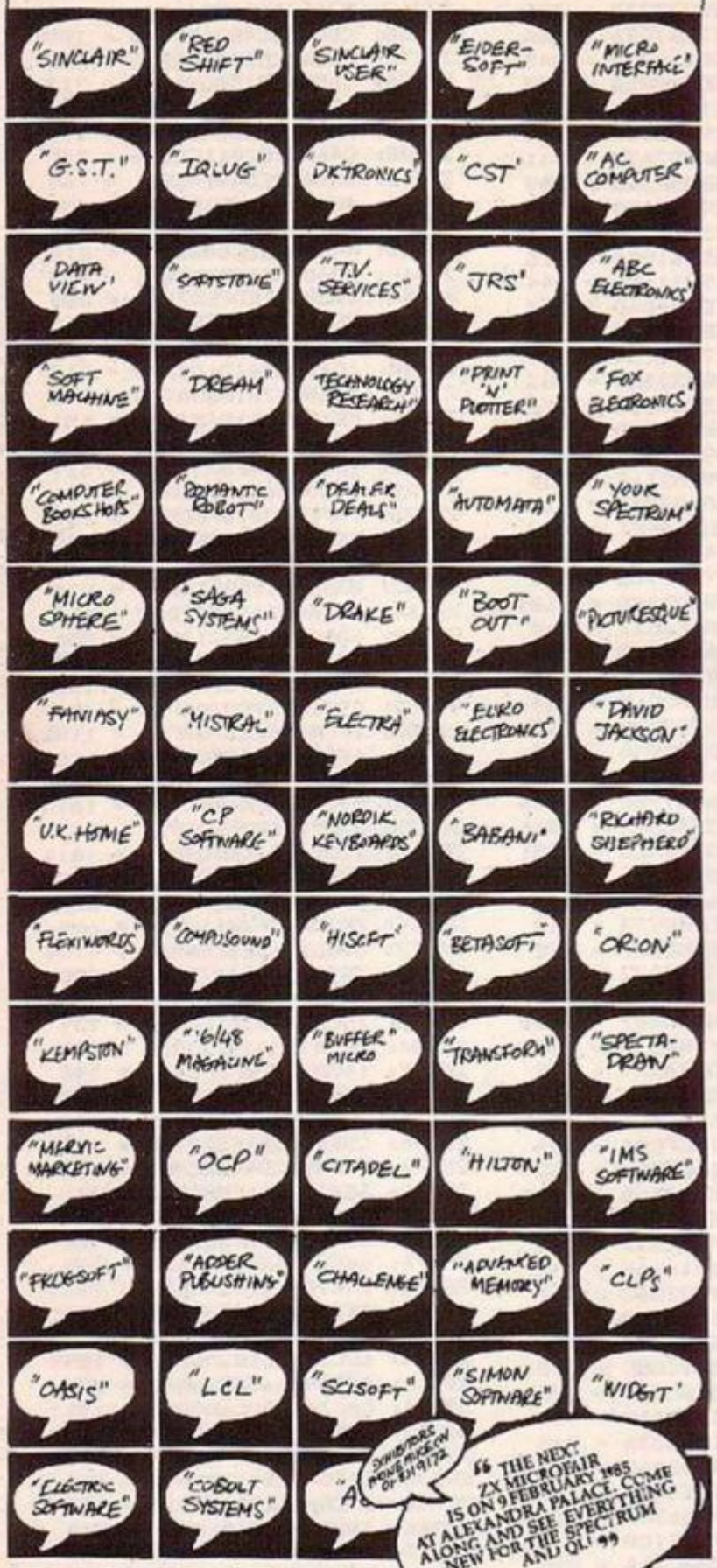
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(continued from page 63)

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26352: 0B23170B18130B26 = 172
26360: 272A282A020A0906 = 190
26368: 292A141F16130B18 = 210
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26416: 262A160F101E2925 = 241
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26440: 2A1D1213101E262A = 234
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28376: 0D6A2112SD3605CD = 525
28384: B869CDB366061E76 = 929
28392: 10FDCD8E6CC3216E = 1062
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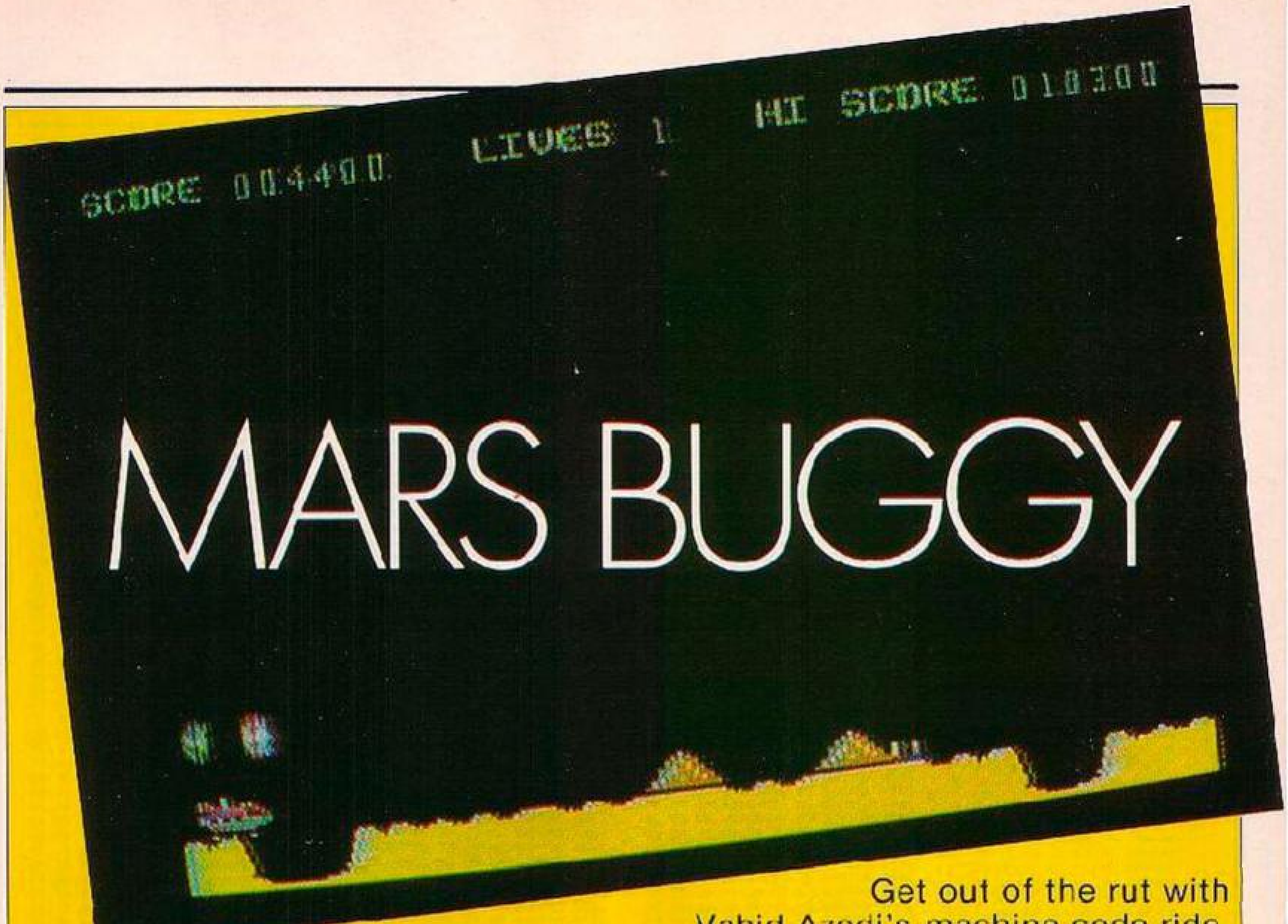
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MARS BUGGY

Get out of the rut with Vahid Azodi's machine code ride.

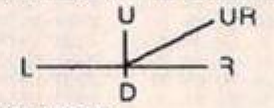
MARS BUGGY is a totally machine-code written game for the Commodore 64 and includes the following features:

- Raster interrupt driven smooth scrolling.
- Multi coloured sprites.
- Very fast and flexible control of buggy — space ship.
- Score and high score feature.

If you have not seen the game in the arcades here is a brief description. You control a buggy which can jump and fire bullets in horizontal and vertical directions.

The game is played on a scrolling screen which scrolls from right to left you have three lives at the beginning of the game and one life is deducted every time you fall into a ditch or hit a rock or get hit by a bullet from the space ships — enemies. The object of the game is to stay alive as long as possible.

You control your ship with a joystick only. Sorry keyboard freaks. The controls are:



- F1 Pause the game.
- F2 Restart game from the middle of another game.
- * When the game is paused you restart the game by moving the joystick.
- U Makes the buggy jump upwards.
- UR Makes buggy jump up and forwards.
- R Keeps buggy steady on the screen.
- L Makes buggy go quickly to the left.

If the buggy is made to jump it will not be able to jump up again straight away so don't panic.

So always bring the joystick to the neutral position — n — after every jump. If you don't, the buggy's wheels will lock and will not be able to jump.

Entering the game is very simple, just type in the program like a Basic game. Then remember to save it before you run it. When run the program displays the title screen and asks you to wait a while for the game to load. Be patient because it's a long wait. The instructions on the screen telling you to wait will change to — press fire to start. Put the joystick into port 2 and press the fire button and hey presto — the game starts.

If you don't want to type in the program there is a cassette available for £3.00 inc. postage and packing from: Mars Buggy, 22 Lorton House, West End Lane, London, NW6.

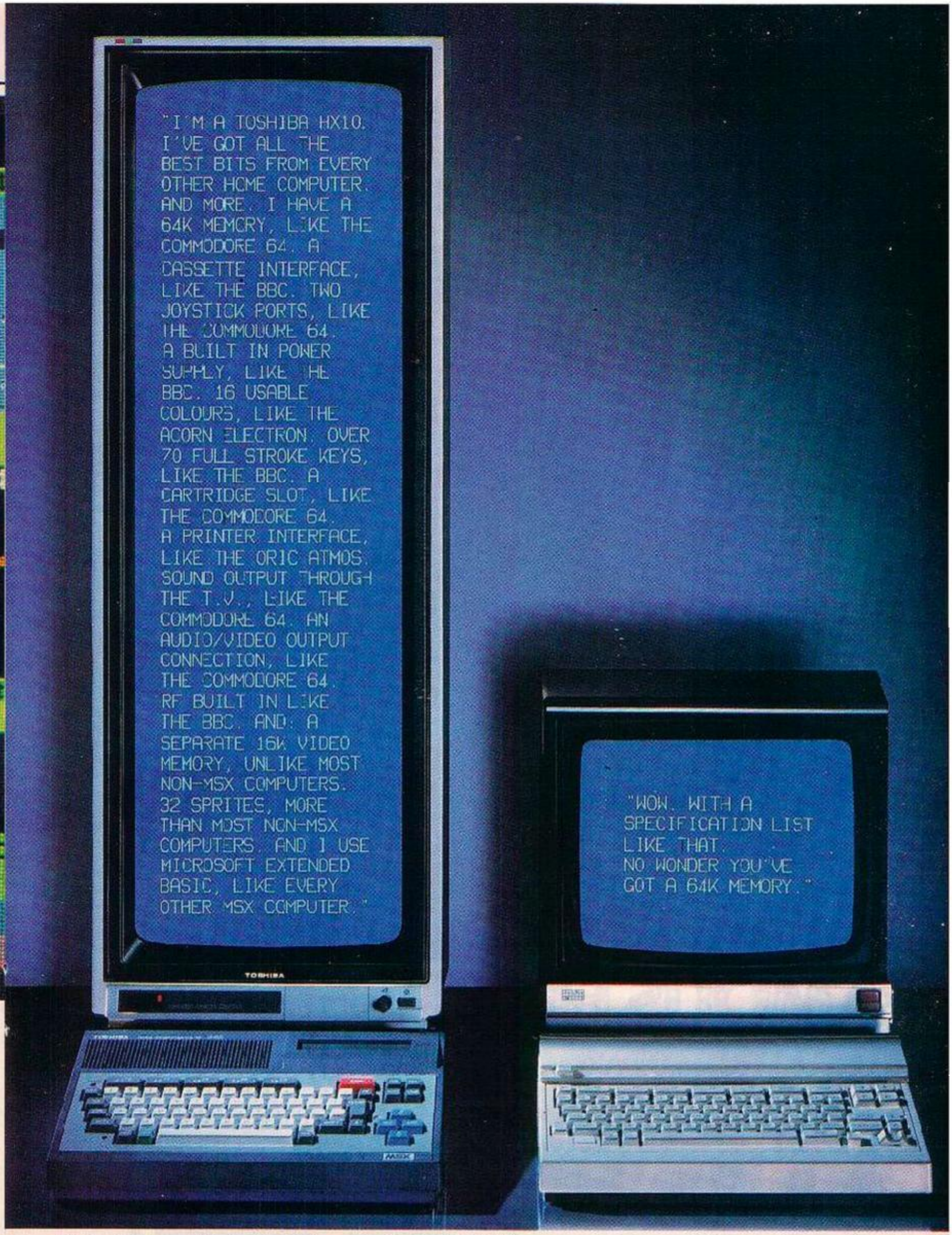
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10 POKE 53280,0:POKE 53281,0:PRINT"[illegible]"
20 PRINT"[illegible]"
30 PRINT"[illegible]"
40 PRINT"[illegible]"
50 PRINT"[illegible]"
60 PRINT"[illegible]"
70 PRINT"[illegible]"
80 PRINT"[illegible]"
90 PRINT"[illegible]PROGRAMMED BY VAHID AZODI"
100 PRINT"[illegible]                FOR"
110 PRINT"[illegible]YOUR COMPUTER (C)1984"
120 PRINT"[illegible]PLEASE WAIT WHILE LOADING DATA"
990 LOC=32768
1000 READD$:IFD$="@@@"THEN 1500
1010 H=ASC(LEFT$(D$,1))-48
1020 IFH>9THEN H=H-7
1030 H1=ASC(RIGHT$(D$,1))-48
1040 IFH1>9 THENH1=H1-7
1050 POKELOC,H*16+H1:LOC=LOC+1:GOTO 1000
1500 FORT=0TO 6349:POKE12288+T,PEEK(32768+T):NEXT T
1510 PRINT"[illegible]            PRESS FIRE TO START"
1540 SYS 4096*3+3*256+16*4+2
2000 DATA00,0E,00,14,00,30,55,00
2001 DATA00,3E,00,28,E3,30,AA,22
2002 DATA00,7C,BE,81,C7,55,00,AA
2003 DATA14,01,7D,00,00,AA,00,00
2004 DATA28,00,00,00,00,30,00,00
2005 DATA00,00,00,00,00,30,00,00
2006 DATA00,00,00,00,00,30,00,00
2007 DATA00,00,00,00,00,30,00,00
2008 DATA00,00,00,00,00,30,14,00
2009 DATA28,55,00,AA,3E,00,7C,E3
2010 DATA81,C7,63,00,C0,3E,01,1D
2011 DATA55,00,AA,14,00,28,00,00
2012 DATA00,00,00,00,00,00,00,00
2013 DATA00,00,00,00,00,00,00,00
2014 DATA00,00,00,00,00,00,00,00
2015 DATA00,00,00,00,00,00,00,ED
2016 DATA00,00,00,00,00,28,00,E0
2017 DATAAA,0A,00,7C,2A,81,C7,3F
2018 DATA00,C4,71,C1,7D,31,00,AA
2019 DATA5F,40,28,2A,80,00,0F,00
2020 DATA00,00,30,00,03,00,0E,00
2021 DATA00,00,30,00,03,00,0E,00
2022 DATA00,00,30,00,03,00,0E,00
2023 DATA00,00,30,00,03,00,0E,80
2024 DATA00,00,30,00,30,00,FE,80
2025 DATA00,34,31,40,55,55,5E,05
2026 DATA55,14,55,55,05,A2,22,AF
2027 DATA5F,FF,7F,57,FF,FC,0F,FF
2028 DATAC0,00,30,00,00,28,00,00
2029 DATA00,00,30,00,00,00,00,00
2030 DATA00,00,30,00,00,00,00,00
2031 DATA00,00,30,00,00,00,00,00
2032 DATA00,00,30,00,00,00,00,00
2033 DATA00,00,00,00,00,00,00,00
2034 DATA00,00,00,FF,C0,03,FF,00
2035 DATA00,00,00,00,C0,03,00,00
2036 DATA00,00,00,00,C0,03,00,00
2037 DATA00,00,00,00,F0,03,00,00
2038 DATA00,00,00,00,00,00,30,00
2039 DATA00,00,00,00,00,00,30,12
2040 DATA00,C0,00,00,C0,00,30,C0
2041 DATA00,00,C0,00,00,C0,30,00
2042 DATAC0,00,00,C0,00,00,20,00
2043 DATA00,00,0E,00,00,00,30,00
2044 DATA00,00,0E,00,00,00,30,00
2045 DATA00,00,0E,00,00,00,30,00
2046 DATA00,00,0E,00,00,00,00,00
2047 DATA00,00,0E,00,00,00,00,00
2048 DATA00,00,0E,00,00,00,00,00
2049 DATA00,00,0E,00,00,80,00,01
2050 DATA42,80,00,24,00,00,18,00
2051 DATA00,3C,00,00,7E,00,03,FF
2052 DATAC0,1F,FF,F8,7E,1B,6E,76
2053 DATA1B,6E,1F,FF,F8,03,FF,C0
2054 DATAC0,7F,00,00,63,00,00,C1
2055 DATAC0,01,80,C0,07,00,70,10
2056 DATAC0,FF,00,FF,00,FF,00,FF
2057 DATA00,FF,00,FF,00,FF,00,00
2058 DATA00,FF,00,FF,00,FF,00,FF
2059 DATA00,FF,00,FF,00,FF,00,FF
2060 DATA00,FF,00,FF,00,FF,00,FF
2061 DATA00,FF,00,FF,00,FF,FE,FF
2062 DATA00,FF,00,FF,FF,FF,00,FF
2063 DATA00,FF,00,FF,24,04,64,24
2064 DATA00,00,00,00,00,00,00,00
2065 DATA00,00,00,00,00,00,00,00
2066 DATA00,00,02,42,40,01,00,80
2067 DATA04,0D,20,01,24,00,03,54
2068 DATAD0,01,12,80,04,AD,20,01
2069 DATA00,00,02,42,40,00,08,00
2070 DATA00,00,00,30,00,00,00,00
2071 DATA00,00,00,20,00,00,00,00
2072 DATA00,00,00,21,00,40,00,00
2073 DATA00,10,80,30,00,00,10,00
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2074 DATA00,00,40,00,02,10,30,00
2075 DATA00,00,00,00,00,00,30,00
2076 DATA0C,00,00,00,00,00,30,00
2077 DATA00,00,40,00,02,00,30,00
2078 DATA00,00,10,10,00,00,30,00
2079 DATA00,01,00,40,00,00,30,00
2080 DATA00,00,00,00,00,00,30,00
2081 DATA00,78,00,80,F0,00,00,30
2082 DATA00,00,31,F0,00,31,17,C0
2083 DATA31,34,4E,31,14,DF,FD,14
2084 DATA51,FJ,94,53,01,16,51,01
2085 DATA04,51,0E,07,D9,00,00,11
2086 DATA00,00,1F,00,00,00,00,00
2087 DATA00,00,0E,00,00,00,00,00
2088 DATA00,00,0E,00,00,00,14,00
2089 DATA00,55,0E,00,3E,00,00,E3
2090 DATA00,00,E3,00,00,3E,30,00
2091 DATA55,00,0E,14,00,00,00,00
2092 DATA00,00,0E,00,00,00,30,00
2093 DATA00,00,00,00,00,00,30,00
2094 DATA00,00,00,00,00,00,30,00
2095 DATA00,00,00,00,00,00,00,ED
2096 DATA00,00,00,00,00,00,30,00
2097 DATA28,00,00,AA,00,00,7C,00
2098 DATA00,C7,A0,A0,C6,00,30,7D
2099 DATA00,00,AA,00,00,28,30,00
2100 DATA00,00,00,00,00,00,30,00
2101 DATA00,00,00,00,00,00,30,00
2102 DATA00,00,00,00,00,00,30,00
2103 DATA00,00,00,00,00,00,30,00
2104 DATA32,00,A0,00,DC,29,10,C9
2105 DATA10,D0,03,4C,42,33,AD,16
2106 DATAD3,09,10,8D,16,D0,A9,93
2107 DATA29,IQ,FF,A9,00,A2,18,9D
2108 DATA [illegible]
2109 DATA [illegible]
2110 DATA06,9D,21,04,C9,00,F0,20
2111 DATA02,47,AD,18,D0,09,0E,8D
2112 DATA18,D0,A9,00,8D,15,04,A9
2113 DATA16,8D,F0,02,8D,F1,07,A9
2114 DATA00,8D,[illegible]
2115 DATA09,05,04,CA,D0,FA,A2,5A
2116 DATA09,05,9D,FF,D7,CA,10,F5
2117 DATA02,A9,07,9D,00,D9,9D,00
2118 DATA00,D8,CA,D0,F7,A9,C0,8D
2119 DATA04,D4,[illegible]
2120 DATA4E,A9,FF,8D,FA,07,A9
2121 DATA00,A9,[illegible]
2122 DATA03,A9,00,8D,55,03,8D,54
2123 DATA05,A9,00,8D,56,03,8D,55
2124 DATA02,22,D0,A9,00,8D,23,10
2125 DATA2,08,A9,00,9D,FF,D8,CA
2126 DATA0,FA,A5,00,50,06,A9,00
2127 DATA2,8D,07,D0,A9,00,8D,15
2128 DATA00,8D,15,D0,A9,FF,8D,12
2129 DATA04,8D,14,D4,8D,0E,D4,8D
2130 DATA0F,D4,A9,81,8D,12,D4,A9
2131 DATA0F,8D,18,D4,A9,2F,8D,00
2132 DATA00,A9,15,D0,8D,10,8D,15
2133 DATA04,A2,A0,A9,00,8D,8E,01
2134 DATA02,20,03,A9,00,8D,8E,03
2135 DATA09,01,9D,4E,02,A9,A9,4D
2136 DATA3E,01,A9,00,8D,4E,03,2D
2137 DATA4D,02,8D,48,03,8D,4A,E3
2138 DATA0D,45,03,8D,EC,03,A9,CD
2139 DATA00,A9,00,A9,00,8D,25,D0
2140 DATA00,0C,8D,26,D0,A9,02,ED
2141 DATA1C,D0,A9,07,8D,27,D0,F9
2142 DATA00,01,00,D0,8D,02,D0,F9
2143 DATAE3,8I,01,D0,A9,0A,8D,F3
2144 DATAD0,A5,00,8D,1E,D0,A9,C3
2145 DATA0D,F5,07,A9,03,0D,.5,D0
2146 DATA0D,15,D0,A9,00,A2,40,9D
2147 DATA7F,3F,CA,D0,FA,A9,FE,ED
2148 DATAFE,07,8D,FF,07,A9,C0,ED
2149 DATA00,3F,8D,03,3F,8D,06,3F
2150 DATA09,85,3F,78,A9,00,8D,EE
2151 DATAUC,A5,D9,8D,14,03,A9,34
2152 DATA0D,15,03,AD,11,D0,29,7F
2153 DATA09,11,D0,A9,D8,8D,.2,10
2154 DATA09,01,8D,1A,D0,58,4C,6A
2155 DATA36,AC,12,D0,C0,D8,D0,E3
2156 DATA4C,EE,34,4C,12,35,AD,16
2157 DATA4C,EE,34,4C,12,35,AD,16
2158 DATA0A,25,F8,0D,3E,03,8D,16
2159 DATA0A,AE,16,D0,29,F7,8D,16
2160 DATA00,2E,3E,35,A9,FB,8D,12
2161 DATA0A,AE,19,D0,8D,19,D0,4C
2162 DATA0C,FE,A9,00,8D,20,D0,8D
2163 DATA2C,DE,A9,D8,8D,12,D0,AD
2164 DATA16,D0,09,0D,10,D0,D0
2165 DATA16,D0,29,F8,8D,16,D0,20
2166 DATA03,3E,AD,19,D0,9D,19,D0
2167 DATA4C,31,EA,AD,7A,03,F0,01
2168 DATA60,AE,20,03,D0,1E,AD,1C
2169 DATA0A,29,F7,8D,16,D0,AD,3E
2170 DATA07,C9,00,D0,05,A9,01,8D
2171 DATA43,03,AD,3E,03,0D,16,D0
2172 DATA8D,16,D0,60,A9,31,9D,20
2173 DATA07,CE,3E,03,AD,02,D0,C9
2174 DATA25,D0,05,60,CE,00,D0,CE
2175 DATA02,AE,60,AD,51,03,C9,01
2176 DATA00,F2,60,AD,3E,03,C9,00
2177 DATAF0,01,60,A0,00,B2,01,BD
2178 DATA70,07,99,70,07,BD,80,07
2179 DATA99,98,07,BD,C0,07,99,C0
2180 DATA07,BD,48,07,99,48,07,BD
2181 DATA78,DB,99,78,DB,BD,98,DB
2182 DATA99,98,DB,BD,C0,DB,99,C0
2183 DATAD8,BD,48,DB,99,48,DB,E0
2184 DATAL8,C0,27,D0,45,A9,07,8D
2185 DATA8D,6F,07,E9,00,41,8D,97
2186 DATA07,E9,00,42,8D,BF,07,E9
2187 DATA00,43,8D,E7,07,99,0E,8D
2188 DATAEF,D5,A9,0E,8D,97,DE,09
2189 DATA07,8D,BF,DB,A9,0C,8D,E7
2190 DATAD3,C0,69,D0,09,99,00,8D
2191 DATA56,03,EE,E0,03,50,EE,56
2192 DATA03,60,4C,BF,35,A0,41,03
2193 DATA03,01,20,03,4C,59,36,A0
2194 DATAC9,00,D0,03,4C,59,36,A0
2195 DATA4F,03,C9,FF,D0,10,A0,4D
2196 DATA03,C9,02,30,08,A9,00,8D
2197 DATA4D,03,4C,3B,36,EE,41,03
2198 DATA4D,4D,03,69,00,8D,F5,07
2199 DATA4C,59,36,AD,4F,03,C5,63
2200 DATA00,17,4D,03,D0,C9,BF,D0
2201 DATA05,A9,3B,8D,03,D0,4C,59
2202 DATA35,A9,3A,8D,03,D0,4C,59
2203 DATA35,AD,4C,03,C9,64,B0,06
2204 DATA09,00,EE,4F,03,60,EE,4C
2205 DATA03,60,20,00,3[illegible]
2206 DATA29,0F,C9,0E,D0,09,A5,[illegible]
2207 DATA0D,48,03,20,F3,36,C9,06
2208 DATA00,0D,A9,01,8D,48,03,20
2209 DATA35,26,03,01,4D,3[illegible]
2210 DATA07,D0,E3,20,59,37,C9,08
2211 DATA00,03,20,6E,37,A9,00,8C
2212 DATA29,10,[illegible]
2213 DATA[illegible]
2214 DATA00,02,20,[illegible]
2215 DATA03,20,[illegible]
2216 DATA38,3[illegible]
2217 DATA03,[illegible]
2218 DATA3D,20,47,3[illegible]
2219 DATA[illegible]
2220 DATA[illegible]
2221 DATA0F,C9,06,10,02,29,F7,96
2222 DATA4C,02,44,F9,01,8D,48,03
2223 DATA09,01,8D,49,03,60,AD,55
2224 DATA03,F0,04,CE,55,03,60,A9
2225 DATA0A,8D,55,03,A0,44,A6,C9
2226 DATA00,D0,01,60,A0,03,D0,C9
2227 DATAC3,D0,05,A9,01,8D,4A,03
2228 DATAAD,03,3D,C9,DC,D0,19,A9
2229 DATA00,8D,49,03,8D,48,03,8D
2230 DATA4B,03,8D,51,03,A9,E3,8D
2231 DATA01,D0,A9,00,8D,48,03,60
2232 DATAAD,4A,03,C9,01,D0,09,EE
2233 DATA03,D0,EE,01,D0,4C,59,37
2234 DATALE,03,20,CE,01,D0,4C,59
2235 DATA37,AD,48,03,C9,01,D0,0D
2236 DATAAD,02,20,C9,FF,F0,06,EE
2237 DATA00,D0,EE,02,D0,60,AD,54
2238 DATA03,F0,04,CE,54,03,60,A9
2239 DATA19,8D,54,03,AD,F8,07,C9
2240 DATAC2,90,05,A9,C0,8D,F8,07
2241 DATAEE,F8,07,FD,02,D0,C9,28
2242 DATA90,05,CE,00,D0,CE,02,D0
2243 DATA50,AD,53,03,F3,04,CE,53
2244 DATA03,60,A9,6A,8D,53,03,AD
2245 DATAF8,07,C9,C2,90,05,A9,C0
2246 DATA00,F0,07,EE,F8,07,AD,02
2247 DATAD0,C9,FF,F0,05,EE,00,D0
2248 DATAEE,02,D0,60,AD,52,03,F0
2249 DATA01,60,AD,E2,D3,8D,04,D0
2250 DATA0D,06,D0,FD,02,D0,0D,05
2251 DATAD0,8D,07,I0,A9,01,8D,52
2252 DATA03,AD, 5,I0,09,0C,8D,15
2253 DATA0D,A9,00,8D,13,D0,60,20
2254 DATA[illegible]
2255 DATA42,50,4C,20,4E,4E,37,00
2256 DATA00,3C,24,24,24,24,24,3C
2257 DATA00,18,08,E8,08,08,08,1C
2258 DATA00,3C,04,04,3[illegible]
2259 DATA00,3C,04,04,1[illegible]
2260 DATA00,04,0C,14,24,3E,04,04
2261 DATA00,3C,20,20,3C,04,04,3C
2262 DATA00,3C,20,20,3C,24,24,3C
2263 DATA00,3C,04,04,04,04,04,04
2264 DATA00,3C,24,24,3C,24,24,3C
2265 DATA00,3C,24,24,3C,04,04,04
2266 DATA69,03,AD,68,D3,8D,0C,D0
2267 DATAAD,09,30,ED,00,D0,AD,15
2268 DATA00,09,40,ED,15,D0,A9,FE,
2269 DATA8D,FF,07,ED,03,08,60,AD
2270 DATA5F,03,F0,04,CE,5F,03,60
2271 DATAA9,02,8D,5F,03,A9,09,D0
2272 DATAC9,78,F0,04,EE,09,D0,06
2273 DATAA9,01,3D,5E,03,60,AD,09
2274 DATA00,F0,04,CE,09,D0,60,A9
2275 DATA00,8D,5E,03,60,A9,68,03
2276 DATAF0,03,4C,E4,3C,AD,64,03
2277 DATAF0,04,CE,64,03,60,A9,05
2278 DATA8D,64,03,FD,6J,03,C9,01
2279 DATA00,10,EE,ED,D0,A9,0D,D0
2280 DATAC9,46,30,E5,A9,01,9D,61
2281 DATA03,60,AD,65,03,F0,06,CE
2282 DATA65,03,4C,2A,3C,A9,4D,8D
2283 DATA65,03,AD,1E,D4,C9,C8,30
2284 DATA08,A9,03,ED,62,03,4C,20
2285 DATA3C,C9,C8,10,0C,C9,64,30
2286 DATA08,A9,02,ED,62,03,4C,20
2287 DATA0C,C9,00,30,0C,C9,64,10
2288 DATA08,A9,01,ED,62,03,4C,20
2289 DATA3C,60,AD,62,03,CD,5E,03
2290 DATA00,03,4C,F5,3B,8D,62,03
2291 DATA3C,01,D0,03,4C,5E,3C,60
2292 DATA02,D0,03,4C,4E,3C,C9,03
2293 DATA00,03,4C,5E,3C,60,AD,09
2294 DATA0D,C9,FA,I0,03,4C,F5,3B
2295 DATA41,44,42,2A,7E,3D,32,
2296 DATAC0,E0,F0,F0,F3,F8,F8,F8
2297 DATA00,00,00,00,00,00,00,00
2298 DATA01,03,03,03,07,07,07,0F
2299 DATAFC,FC,FC,F8,F8,F8,F8,F8
2300 DATA00,00,00,00,03,E6,FF,FF
2301 DATA00,00,00,00,00,0F,FF,FF
2302 DATA0F,0F,3F,1F,FF,FF,FF,FF
2303 DATA0F,1F,7F,FF,FF,FF,FF,FF
2304 DATAF0,F8,FE,FF,FF,FF,FF,FF
2305 DATAFF,FF,FF,FF,FF,FF,FF,FF
2306 DATA00,E0,FF,FF,FF,FF,FF,FF
2307 DATA7C,FF,FF,FF,FF,FF,FF,FF
2308 DATA03,0F,FF,FF,FF,FF,FF,FF
2309 DATA00,00,00,00,03,0F,FF,FF
2310 DATA00,00,00,00,03,05,2A,A6
2311 DATA00,00,00,00,03,06,00,80
2312 [illegible]
2313 DATA09,99,5A,6A,A6,AF,AA,00
2314 DATA00,00,40,69,99,AF,AA,00
2315 DATA00,42,7E,42,42,FF,FF,
2316 DATA35,30,32,34,00,F0,39,32
2317 DATA8E,52,54,F6,20,30,33,00
2318 DATA6A,53,44,9E,43,44,47,06
2319 DATA46,F2,52,F6,54,76,55,A6
2320 DATA00,32,FF,8F,3A,4E,CE,2A
2321 DATA3A,69,4C,44,41,20,23,30
2322 DATA00,20,39,44,89,53,54,41
2323 DATA20,31,30,34,30,AE,38,00
2324 DATA2F,3A,4E,89,49,4E,43,20
2325 DATA31,30,33,39,AE,38,00,39
2326 DATA0A,58,89,4A,4D,50,20,49
2327 DATA00,4C,34,42,89,5A,58,32
2328 DATA20,4C,41,41,20,31,30,00
2329 DATAAD,52,02,C9,00,D0,01,60
2330 DATAAD,04,D0,C9,59,D0,28,AD
2331 DATA10,D0,29,04,C9,04,D0,1F
2332 DATAAD,15,D0,29,FB,8D,15,D0
2333 DATAA9,00,8D,05,D0,8D,04,D0
2334 DATAAD,15,D0,29,08,C9,08,F0
2335 DATA06,A9,00,8D,32,03,60,AD
2336 DATA04,D0,C9,FF,D0,0D,A9,00
2337 DATA8D,04,D0,A9,10,D0,09,04
2338 DATA8D,10,D0,EE,04,D0,AD,07
2339 DATAD0,C9,15,D0,0B,AD,15,D0
2340 DATA29,F7,8D,15,D0,4C,AC,3A
2341 DATACE,07,D0,60,A0,FF,8D,07
2342 DATA00,A9,00,8D,06,D0,60,AD
2343 DATA5C,03,F0,03,4C,AC,3D,AD
2344 DATA59,03,F0,0[illegible]CE,59,03,60
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2346 DATAC9,01,F0,10,EE,09,D0,AD
2347 DATA09,D0,C9,4C,D0,05,A9,01
2348 DATA8D,5C,03,60,AD,67,03,F0
2349 DATA06,CE,67,03,4C,24,3E,A9
2350 DATA4B,8D,67,03,AD,1B,D4,C9
2351 DATAC8,30,08,A9,03,8D,5A,03
2352 DATA4C,24,33,C9,C8,10,0C,29
2353 DATA64,30,08,A9,02,8D,5A,03
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2355 DATA64,10,08,A9,01,8D,5A,03
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2357 DATA5B,03,D0,01,4C,EF,3A,3D
2358 DATA5A,03,C9,01,D0,03,4C,58
2359 DATA3B,C9,02,D0,03,4C,48,3B
2360 DATAC9,00,D0,01,4C,58,3B,50
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2363 DATAAD,0B,D0,C5,19,D0,03,4C
2364 DATAEF,3A,CE,0E,D0,4C,8F,3B
2365 DATAA9,00,8D,57,03,A9,01,8D
2366 DATA69,03,AD,0E,D0,8D,0C,D0
2367 DATAAD,09,D0,01,0D,D0,AD,15
2368 DATA00,02,4C,01,15,D0,A9,FE
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2375 DATA00,8D,5E,01,60,AD,68,03
2376 DATAF0,03,4C,B4,3C,AD,64,03
2377 DATAF0,04,CE,64,03,60,A9,05
2378 DATA8D,64,03,AI,61,03,C9,01
2379 DATAF0,13,EE,0E,D0,AD,0E,D0
2380 DATAC9,45,D0,05,A9,01,8D,61
2381 DATA03,60,AD,65,03,F0,06,CE
2382 DATA65,03,4C,2F,3C,A9,4B,8D
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2386 DATA08,A9,02,ED,62,03,4C,20
2387 DATA0C,C9,00,30,0C,C9,64,10
2388 DATA08,A9,01,ED,62,03,4C,20
2389 DATA3C,60,AD,62,03,CD,5E,03
2390 DATA00,03,4C,F5,3B,8D,62,03
2391 DATA3C,01,D0,03,4C,4E,3C,C9
2392 DATA02,D0,03,4C,4E,3C,C9,03
2393 DATA00,03,4C,5E,3C,60,AD,09
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2395 DATA41,44,42,2A,7E,3D,32,
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2398 DATA01,03,03,03,07,07,07,0F
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2403 DATA0F,1F,7F,FF,FF,FF,FF,FF
2404 DATAF0,F8,FE,FF,FF,FF,FF,FF
2405 DATAFF,FF,FF,FF,FF,FF,FF,FF
2406 DATA00,E0,FF,FF,FF,FF,FF,FF
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2409 DATA00,00,00,00,03,0F,FF,FF
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2412 [illegible]
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2415 DATA00,42,7E,42,42,FF,FF,
2416 DATA35,30,32,34,00,F0,39,32
2417 DATA8E,52,54,F6,20,30,33,00
2418 DATA6A,53,44,9E,43,44,47,06
2419 DATA46,F2,52,F6,54,76,55,A6
2420 DATA00,32,FF,8F,3A,4E,CE,2A
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2422 DATA00,20,39,44,89,53,54,41
2423 DATA20,31,30,34,30,AE,38,00
2424 DATA2F,3A,4E,89,49,4E,43,20
2425 DATA31,30,33,39,AE,38,00,39
2426 DATA0A,58,89,4A,4D,50,20,49
2427 DATA00,4C,34,42,89,5A,58,32
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2443 DATA5C,03,F0,03,4C,AC,3D,AD
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2459 DATA3B,C9,02,D0,03,4C,48,3B
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2462 DATAEF,3A,EE,0E,D0,4C,8F,3B
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2468 DATA00,02,4C,01,15,D0,A9,FE
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2475 DATA00,8D,5E,01,60,AD,68,03
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2477 DATAF0,04,CE,64,03,60,A9,05
2478 DATA8D,64,03,AI,61,03,C9,01
2479 DATAF0,13,EE,0E,D0,AD,0E,D0
2480 DATAC9,45,D0,05,A9,01,8D,61
2481 DATA03,60,AD,65,03,F0,06,CE
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2485 DATA3C,C9,C8,10,0C,C9,64,30
2486 DATA08,A9,02,ED,62,03,4C,20
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2491 DATA3C,01,D0,03,4C,4E,3C,C9
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2494 DATA0D,C9,FA,I0,03,4C,F5,3B
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2502 DATA0F,0F,3F,1F,FF,FF,FF,FF
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2504 DATAF0,F8,FE,FF,FF,FF,FF,FF
2505 DATAFF,FF,FF,FF,FF,FF,FF,FF
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2507 DATA7C,FF,FF,FF,FF,FF,FF,FF
2508 DATA03,0F,FF,FF,FF,FF,FF,FF
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2516 DATA35,30,32,34,00,F0,39,32
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2532 DATAAD,15,D0,29,FB,8D,15,D0
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2541 DATACE,07,D0,60,A0,FF,8D,07
2542 DATA00,A9,00,8D,06,D0,60,AD
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2546 DATAC9,01,F0,10,EE,09,D0,AD
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2558 DATA5A,03,C9,01,D0,03,4C,58
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2574 DATAD0,F3,04,CE,09,D0,60,A9
2575 DATA00,8D,5E,01,60,AD,68,03
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2577 DATAF0,04,CE,64,03,60,A9,05
2578 DATA8D,64,03,AI,61,03,C9,01
2579 DATAF0,13,EE,0E,D0,AD,0E,D0
2580 DATAC9,45,D0,05,A9,01,8D,61
2581 DATA03,60,AD,65,03,F0,06,CE
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2583 DATA65,03,AD,1E,D4,C9,C8,30
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2586 DATA08,A9,02,ED,62,03,4C,20
2587 DATA0C,C9,00,30,0C,C9,64,10
2588 DATA08,A9,01,ED,62,03,4C,20
2589 DATA3C,60,AD,62,03,CD,5E,03
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2594 DATA0D,C9,FA,I0,03,4C,F5,3B
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2597 DATA00,00,00,00,00,00,00,00
2598 DATA01,03,03,03,07,07,07,0F
2599 DATAFC,FC,FC,F8,F8,F8,F8,F8
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2603 DATA0F,1F,7F,FF,FF,FF,FF,FF
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2605 DATAFF,FF,FF,FF,FF,FF,FF,FF
2606 DATA00,E0,FF,FF,FF,FF,FF,FF
2607 DATA7C,FF,FF,FF,FF,FF,FF,FF
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2609 DATA00,00,00,00,03,0F,FF,FF
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2612 [illegible]
2613 DATA09,99,5A,6A,A6,AF,AA,00
2614 DATA00,00,40,69,99,AF,AA,00
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(continued on page 71)



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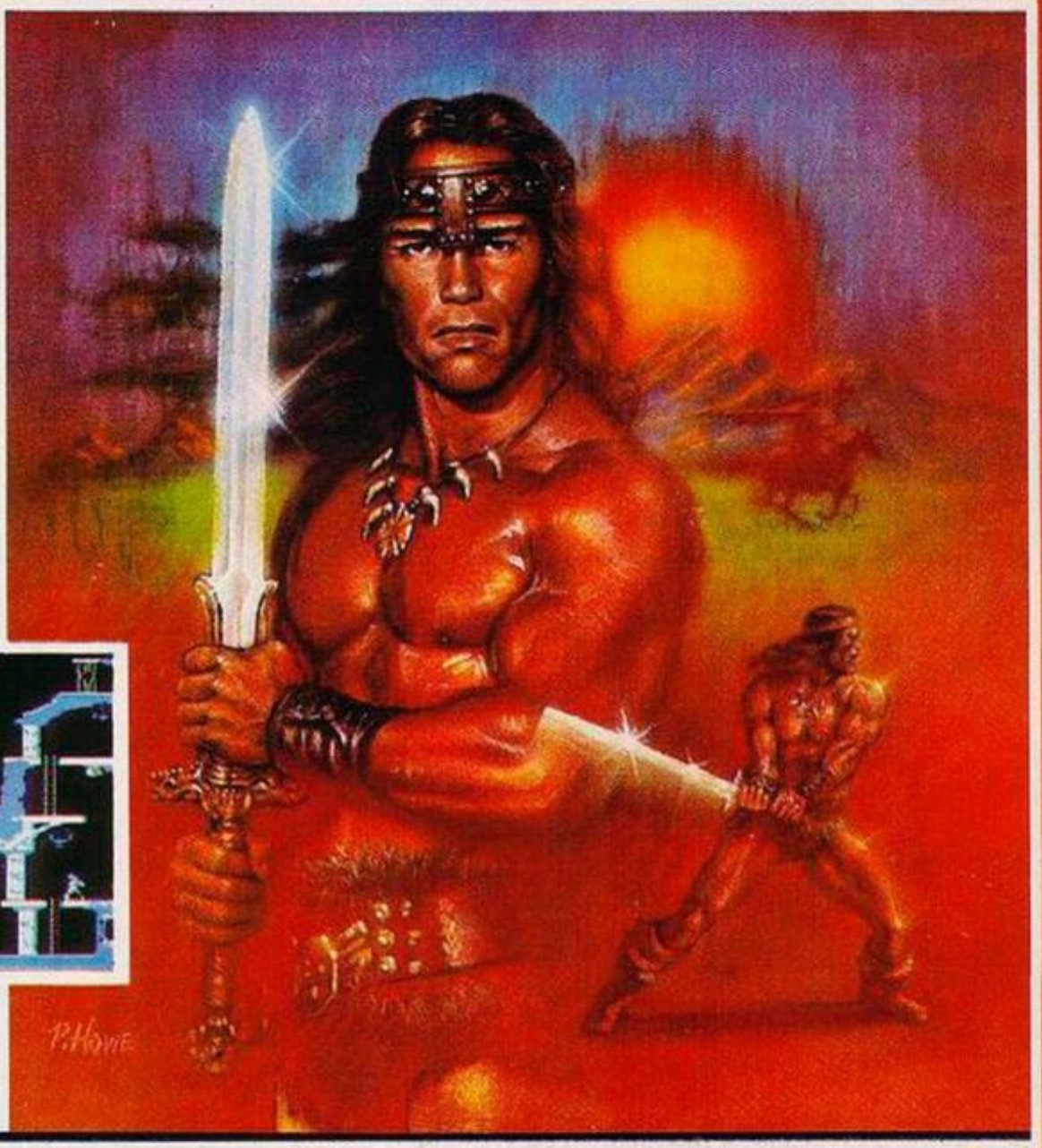
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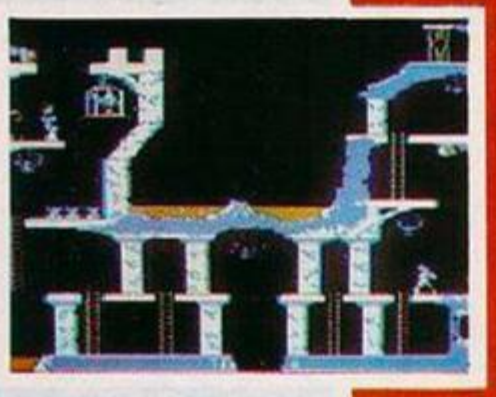
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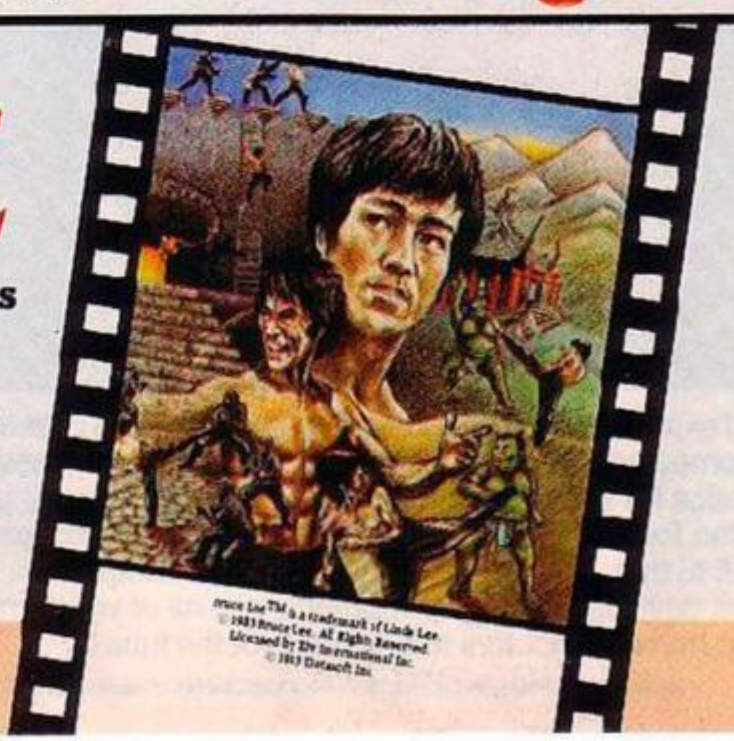
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2557 DATA20,20,20,00,FF,00,FF,00
2558 DATAFF,00,FF,00,FF,00,FF,00
2559 DATAFF,00,FF,00,FF,00,FF,00
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2595 DATA00,74,00,6F,00,FF,00,FF
2596 DATA00,FF,00,FF,04,FF,00,FF
2597 DATA00,DF,00,FF,F2,FF,00,FE
2598 DATA00,FF,00,FF,00,FF,00,00
2599 DATA00,FF,00,F6,20,30,00,F7
2600 DATA00,FF,00,FF,00,FF,00,FF
2601 DATA00,FF,00,FF,00,FF,00,FF
2602 DATA00,FF,00,FF,00,FF,00,FF
2603 DATA00,FF,00,FF,00,FF,00,FF
2604 DATA00,FF,00,FF,00,FF,00,FF
2605 DATA00,FF,00,FF,00,FF,00,FF
2606 DATA00,FF,00,00,00,FF,00,FF
2607 DATA00,FF,00,FF,01,67,FF,00
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2609 DATA31,31,31,31,31,31,31,2B
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2614 DATA31,31,31,31,31,31,31,31
2615 DATA2B,2C,2D,2E,31,31,31,31
2616 DATA31,2B,2C,35,2D,2E,31,31
2617 DATA31,31,31,2B,2C,30,35,2E
2618 DATA31,31,31,31,31,31,31,31
2619 DATA31,31,31,31,31,31,31,31
2620 DATA31,31,31,31,31,31,31,31
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2622 DATA00,FD,00,FD,00,FD,00,FD
2623 DATA00,FD,20,FD,64,FF,00,60
2624 DATA00,FF,00,80,ED,03,00,FE
2625 DATA00,FF,00,FD,00,9F,00,FE
2626 DATA20,F3,00,FB,69,01,60,92
2627 DATA00,F4,00,EC,20,FB,08,40
2628 DATA04,FF,00,FF,04,BF,00,FF
2629 DATA00,00,00,FF,FB,24,00,00
2630 DATA00,FF,00,FF,69,FB,00,00
2631 DATA00,00,00,4C,F9,69,00,69
2632 DATA0C,FF,00,7E,00,FF,40,EE
2633 DATA04,FF,FF,FF,40,77,04,67
2634 DATA00,FF,00,FF,00,FF,08,F1
2635 DATA05,FF,00,FF,19,29,08,41
2636 DATA00,ED,20,ED,60,A9,00,E1
2637 DATA00,DD,00,FD,6D,B5,E6,85
2638 DATAFF,FB,08,00,08,FA,00,E9
2639 DATA68,AC,28,28,68,60,6D,28
2640 DATAFF,E0,AD,78,03,C9,01,D0
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2642 DATA0E,45,20,08,48,20,93,46
2643 DATA20,BE,46,4C,6A,3E,4C,9E
2644 DATA49,AD,78,03,C9,01,D0,03
2645 DATA4C,4F,44,C9,02,D0,03,4C
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2648 DATAC9,05,D0,03,4C,AF,44,C9
2649 DATA06,D0,03,4C,C7,44,60,AD
2650 DATA01,D0,C9,46,D0,03,E9,02
2651 DATA0D,78,03,4C,1E,44,CE,01
2652 DATAD0,CE,05,D0,4C,1A,44,AD
2653 DATA01,D0,C9,EB,D0,E8,A9,03
2654 DATA0D,78,03,4C,1E,44,CE,01
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2673 DATA0D,79,03,CE,79,03,AE,32
2674 DATAA0,32,88,D0,FD,CA,D0,F8
2675 DATA4C,1E,44,60,4C,34,46,A9
2676 DATA33,8D,15,D0,A9,0E,8D,18
2677 DATAD0,A9,00,8D,00,D0,8D,02
2678 DATAD0,A9,C0,8D,58,A9,A9,53
2679 DATA8D,01,30,A9,D8,8D,03,D0
2680 DATAA9,C3,8D,54,A7,A9,00,8D
2681 DATA70,03,D0,A2,00,FF,A7,A9
2682 DATA09,8D,56,03,4C,6F,36,AD
2683 DATA52,03,D0,01,60,AE,04,D0
2684 DATAE9,18,8D,78,03,AE,05,D0
2685 DATAE9,32,8D,72,03,AE,78,03
2686 DATA4A,4A,4A,8D,7E,03,AD,7C
2687 DATA03,4A,4A,44,8D,7C,03,A9
2688 DATA00,A0,AE,72,03,18,69,28
2689 DATA01,02,C8,13,CA,D0,F7,8D
2690 DATA36,03,8C,37,03,18,AD,36
2691 DATA03,6D,7D,03,8D,36,03,AD
2692 DATA37,03,69,00,8D,37,03,AD
2693 DATA10,D0,29,01,C9,04,D0,10
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2695 DATAAD,37,03,69,00,8D,37,03
2696 DATA09,00,85,FB,A9,04,85,FC
2697 DATA05,FB,6D,36,03,85,FB,A5
2698 DATAFC,6D,37,03,85,FC,A0,00
2699 DATAB1,FB,8D,7D,03,60,AD,7D
2700 DATA03,C9,20,D0,01,60,C9,26
2701 DATAD0,01,60,C9,3B,D0,01,60
2702 DATA20,3C,47,A0,00,A9,20,91
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2706 DATA4D,04,D0,8D,05,D0,8D,06
2707 DATAD0,A9,FF,8D,07,D0,A9,90
2708 DATA05,FB,E9,05,85,FC,A9,20
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2713 DATACA,D0,F8,CE,7E,03,4C,3C
2714 DATA16,8D,15,04,F0,03,4C,C5
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2716 DATA05,8D,FF,04,A9,00,8D,15
2717 DATA00,A9,CB,8D,35,05,8D,B0
2718 DATA04,A9,17,8D,36,05,8D,B1
2719 DATA04,A9,8F,8D,37,05,8D,B2
2720 DATA04,A9,20,A9,19,8D,B4,04
2721 DATA9,21,ED,B5,04,A9,0F,8D
2722 DATA8F,04,F9,1C,88,B2,04,A9
2723 DATA1A,0D,1F,05,A9,1C,8D,20
2724 DATA05,A9,CF,8D,21,05,A9,1D
2725 DATA8D,22,05,8D,23,05,A9,19
2726 DATA8D,25,05,A9,13,8D,26,05
2727 DATA09,1C,ED,27,05,A9,0F,8D
2728 DATA28,05,A9,19,8D,29,05,A9
2729 DATA19,8D,2B,05,A9,1C,8D,2C
2730 DATA05,A9,CB,8D,2E,05,A9,18
2731 DATA8D,30,C5,A9,0F,8D,31,05
2732 DATAA9,22,ED,32,05,AD,00,DC
2733 DATA29,10,C9,10,D0,03,4C,E5
2734 DATA16,4C,9A,47,60,A9,20,A2
2735 DATA58,9D,48,07,CA,D0,F9,4C
2736 DATA1F,45,A9,1D,8D,00,04,8D
2737 DATA1F,04,8D,13,04,A9,0D,8D
2738 DATA01,04,8D,1D,04,A9,19,8D
2739 DATA02,04,8D,1E,04,A9,1C,8D
2740 DATA03,04,8D,1F,04,A9,05,8D
2741 DATA04,04,8D,05,04,8D,27,04
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2744 DATA11,04,A9,13,8D,1A,04,A9
2745 DATA12,8D,17,04,60,AD,22,04
2746 DATAC1,06,04,30,37,F0,03,4C
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2751 DATA09,04,30,10,F0,03,4C,5C
2752 DATA46,AD,26,04,CD,0A,04,30
2753 DATA03,4C,5C,46,A2,06,2D,05
2754 DATA04,9D,21,04,CA,D0,F7,4C
2755 DATA5C,46,A9,00,A2,06,9D,05
2756 DATA04,CA,D0,FA,A9,20,A2,00
2757 DATA9D,AF,04,CA,D0,FA,A9,20
2758 DATAA2,A0,9D,47,07,CA,D0,FA
2759 DATA4C,77,33,60,A9,0C,8D,05
2760 DATAD4,A9,00,8D,06,D4,A9,03
2761 DATA81,00,D4,A9,1A,8D,01,D4
2762 DATAA9,90,8D,04,D4,A9,81,8D
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2767 DATAD4,A9,80,8D,04,D4,A9,81
2768 DATA8D,04,D4,A9,00,8D,EC,03
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2770 DATA60,AD,49,03,C9,00,F0,09
2771 DATAA9,00,8D,07,D4,8D,08,D4
2772 DATA60,A9,11,8D,08,D4,AD,ED
2773 DATA03,F0,04,CE,ED,03,60,A9
2774 DATA08,8D,ED,03,AD,EB,03,C9
2775 DATAD4,F0,20,AD,E9,03,8D,07
2776 DATAD4,AD,EA,03,8D,08,D4,18
2777 DATAAD,E9,03,69,1F,8D,E9,03
2778 DATAAD,EA,03,69,00,8D,EA,03
2779 DATAEF,EE,03,A9,18,8D,E9,03
2780 DATAA9,02,8D,EA,03,A9,10,8D
2781 DATA03,D4,A9,00,8D,EC,03,60
2782 DATAA9,03,8D,E9,03,A9,10,8D
2783 DATA0C,D4,A9,00,8D,EB,03,8D
2784 DATA0D,D4,A9,18,8D,E9,03,A9
2785 DATA02,8D,EA,03,6D,A9,00,8D
2786 DATA08,9D,55,D4,CA,D0,FA,60
2787 DATA4C,DF,47,A5,C5,C9,04,D0
2788 DATA14,AD,00,DC,29,0F,C9,0F
2789 DATAD0,08,A9,01,8D,7A,03,8D
2790 DATAEC,03,AD,7A,03,6D,A5,C5
2791 DATAEE,03,8D,7A,03,60,A5,C5
2792 DATA09,05,D0,03,4C,3E,33,60
2793 DATA9C,5E,00,8D,46,68,00,90
2800 DATA ###
```



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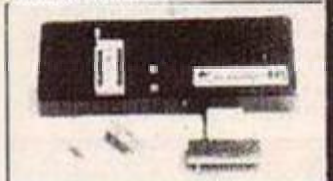
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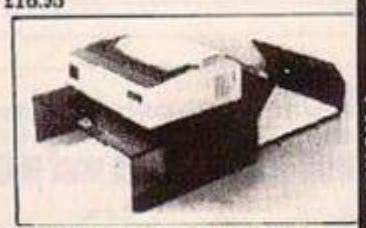
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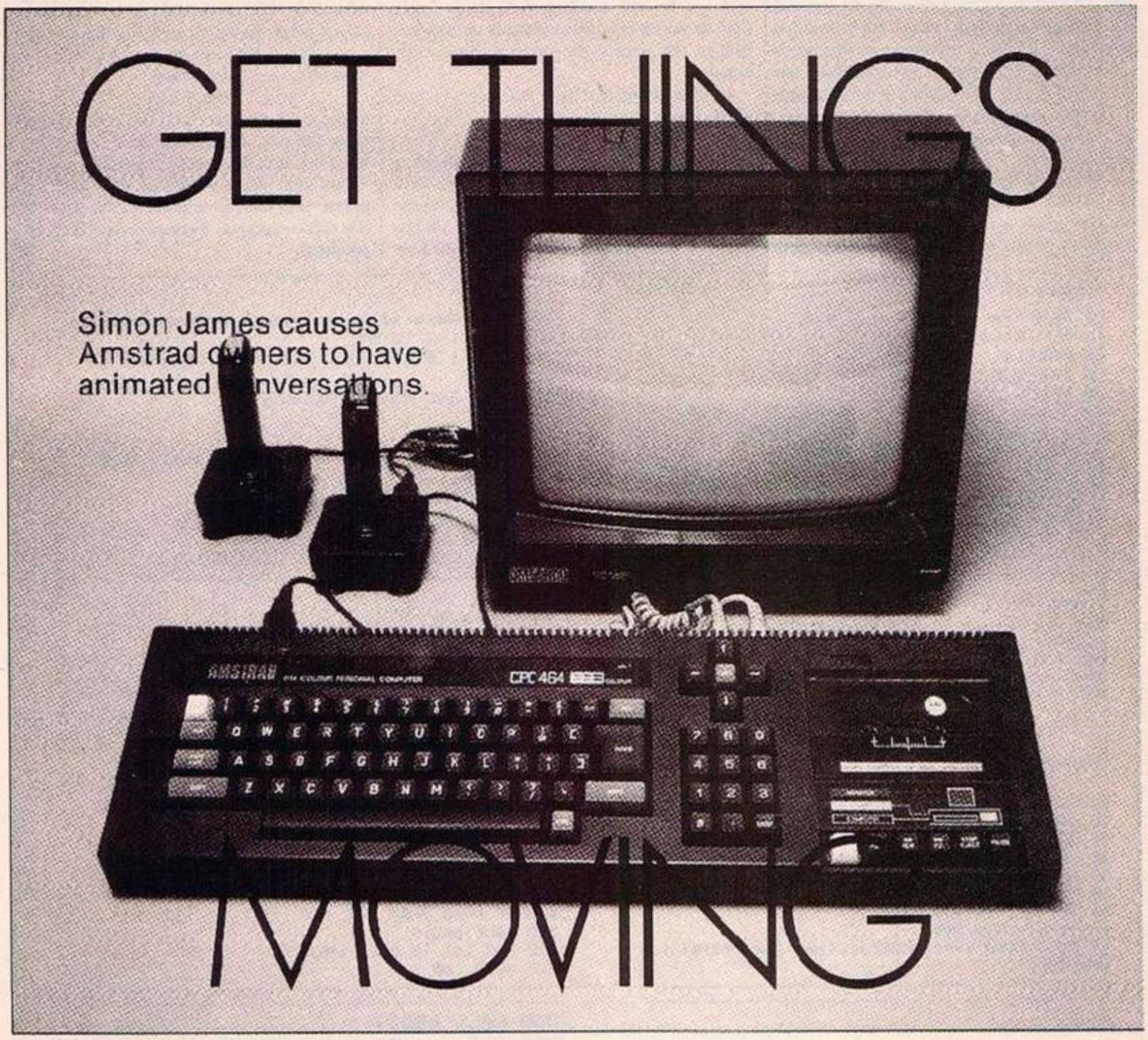
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GET THINGS MOVING

Simon James causes Amstrad owners to have animated conversations.



AN INTERESTING and very useful feature of the new Amstrad computer, is its Ink command. This enables you to redefine the colours available in any mode to those which suit you. The User Guide explains it by reference to pens and ink. For instance, in mode 0 there are 16 colours available, from a palette of 27 colours. This is like having 16 pens and 27 ink pots available and the ink in any pen can be changed. It is something like VDU 19 command on the BBC micro. As an example type in:

```
(Reset (Press 'Ctrl' and 'Shift' and then
'Esc', holding all three down) INK 1,9
(Enter)
```

You will see that all the writing on the screen has changed colour — or shade if you have a green monitor. This is because when you switch on or Reset the computer, pen 1 is being used, and is set to colour 24, bright yellow. The above Ink command told the computer to change the ink in pen 1 to number nine, green. Try other numbers, for instance,

```
INK 1,16 (changes the ink in pen 1 to
```

orange) until you get the hang of it.

This command can be used to produce animation — movement — on the screen. It is done by redefining all the available colours to the background colour, and making one colour at a time visible. Type in listing 1 and run it. You will see at the start, the screen being filled up with multicoloured vertical lines. Then most of them disappear, and a few start to move across the screen.

In actual fact, nothing is really moving. What happens is that lines are drawn using the 16 different pens. These pens are defined as various colours after a Reset or switch on. You can see what these colours are by reference to pages F3.2 and F3.4 in the manual. The program then changes the ink in all of these pens to black — the background colour — so the lines appear invisible. Then each pen in turn is filled with bright white, and the effect of movement is achieved.

Program 2 is the part of the program that actually changes the colours. Study carefully how it works and then type it in and save it. It can then be merged — see Ch.8 page 27 — into any programs you write which use this technique.

Program 3 shows the spectacular effects that can be produced by this useage of the Ink command. 16 circles are drawn — using Sin and Cos, see page F3.13 — using different pens, and each one illuminated in turn.

This method can also be a lot faster than other ways of animating, because all that is required is a few lines of Basic, and several objects at once can move, where other methods would have to deal with each in turn — and would therefore be slower. Program 4 is a good example of this. Pens 2 to 15 are used for the movement, pen 0 being the background colour, and pen 1 the pen used for the writing, and the boxes. If pen 1 was used in the animation sequence, the boxes would flash on and off. Note that this effect could be quite useful, but was unecessary in this program.

Another point to note is that in programs 1, 3 and 4, if you break, using (Esc) (Esc), and Run them again, the initialisation sequence

(continued on next page)

(continued from previous page)

where the multicoloured lines are drawn, will be invisible since all the pens have been filled with black ink, and are being written onto black paper. So do not assume something has gone wrong with the program if nothing happens for a few minutes. This is most noticeable in program 3 with the circles, in which the circles take a while to draw.

In programs 3 and 4 I have included a delay loop which can be altered by changing the variable 'delay' defined at the beginning of the programs. If you remove the loop altogether, you will get some idea of the speed that can be achieved by this method. And don't forget that no matter how many moving objects you had on the screen, the speed would be the same!

Another thing that was put into the programs was:-

CALL &BD19

This is a call to the machine operating system which makes the computer pause until the next frame, — i.e. until a full sweep of the screen is finished by the mechanism inside the monitor. Each frame takes about 1/50 of a second, so this does not slow down the program noticeably, but prevents some strange effects taking place. As an example of what can happen without this instruction, remove line 205 from Program 1, by typing:

205(Enter)

and run the program. You will see that sometimes there are two vertical lines close to each other crossing the screen, sometimes just one.

You can now try writing your own programs — if you feel confident enough! — using this technique, because it has enormous potential. ■

Program 1.

```
10 REM *** PROGRAM ONE ***
15 REM Initialise
20 MODE 0
30 INK 0,0
40 PAPER 0
50 col=1
55 REM Draw multicoloured lines
60 FOR x=10 TO 639 STEP 10
70 MOVE x,5
80 DRAW x,395,col
90 col=(col+1) MOD 16
110 IF col=0 THEN col=1
120 NEXT
125 REM Make all the pens black except pen 1
130 FOR i=2 TO 15
140 INK i,0
150 NEXT
155 REM Get things moving
160 x=1
170 INK x,26
180 IF x=1 THEN INK 15,0 ELSE INK x-1,0
190 x=x+1
200 IF x=16 THEN x=1
205 CALL &BD19
210 GOTO 170
```

Program 2.

```
3000 REM ROUTINE TO SWAP COLOURS
3001 REM Use for merging into your own programs
3002 FOR i=2 TO 15
3003 INK i,0
3004 NEXT
3005 x=1
3006 INK x,26
3007 IF x=1 THEN INK 15,0 ELSE INK x-1,0
3008 x=x+1
3009 IF x=16 THEN x=1
3010 CALL &BD19
3011 GOTO 3006
```

Program 3.

```
10 REM *** PROGRAM THREE ***
20 MODE 0
30 delay=20
40 INK 0,0
50 DEG
60 FOR i=1 TO 15
70 FOR j=1 TO 360 STEP 1
80 ORIGIN 320,200
90 PLOT (180-12*i)*COS(j),(180-12*i)*SIN(j),i
100 NEXT
110 NEXT
120 FOR i=2 TO 15
130 INK i,0
140 NEXT
145 REM FIRE AWAY!
150 x=1
160 INK x,26
170 IF x=1 THEN INK 15,0 ELSE INK x-1,0
180 x=x+1
190 IF x=16 THEN x=1
200 CALL &BD19
210 FOR i=1 TO delay:NEXT
220 GOTO 160
```

Program 4.

```
10 REM *** PROGRAM 4 ***
20 MODE 0
30 RESTORE
40 delay=100
50 PEN 1
60 LOCATE 8,2:PRINT "BOXES"
70 FOR i=1 TO 4
80 READ x,y
90 GOSUB 290
100 NEXT
110 DATA 100,300,100,50,500,50,500,300
120 RESTORE
130 FOR a=1 TO 4
140 READ x,y
150 GOSUB 430
160 NEXT
170 FOR i=3 TO 15
180 INK i,0
190 NEXT
200 x=2
210 INK x,26
220 IF x=2 THEN INK 15,0 ELSE INK x-1,0
230 x=x+1
240 IF x=16 THEN x=2
250 CALL &BD19
260 FOR q=1 TO delay:NEXT
270 GOTO 210
280 END
290 REM SUBROUTINE TO DRAW BOXES
300 MOVE x,y
310 DRAWR 0,-50,1
320 DRAWR 65,0,1
330 DRAWR 0,50,1
340 DEG
350 MOVE x,y
360 FOR z=1 TO 360 STEP 20
370 ORIGIN x,y
380 DRAW 5*COS(z),5*SIN(z),1
390 NEXT
400 ORIGIN 0,0
410 RETURN
420 REM SUBROUTINE TO DRAW LIDS
430 DEG
440 col=2
450 FOR z=1 TO 90 STEP 6.9
460 ORIGIN x,y
470 DRAW 60*COS(z),60*SIN(z),col
480 col=col+1
490 NEXT
500 RETURN
```

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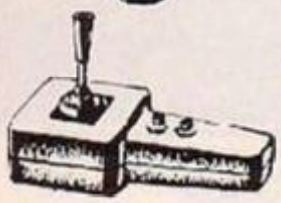
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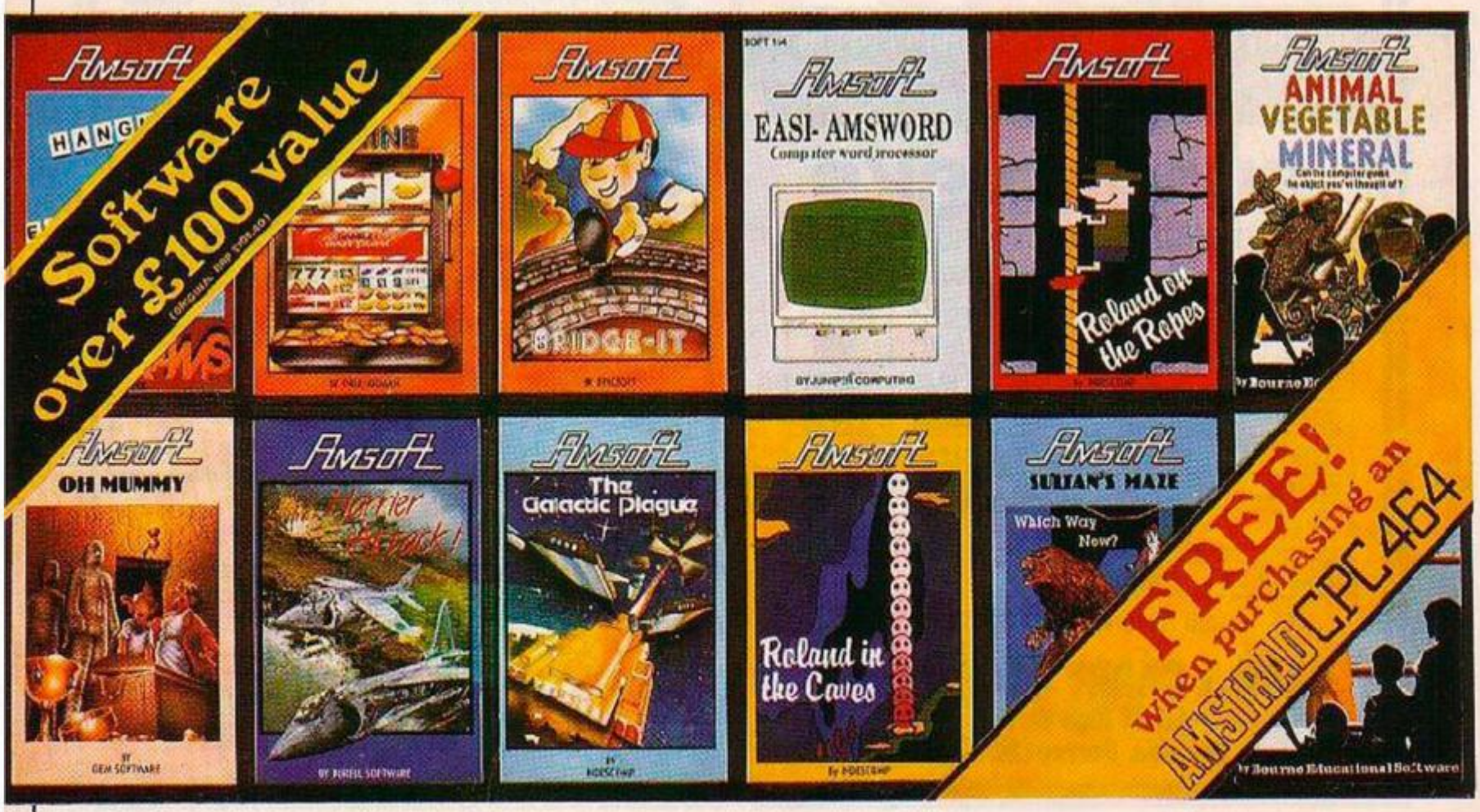
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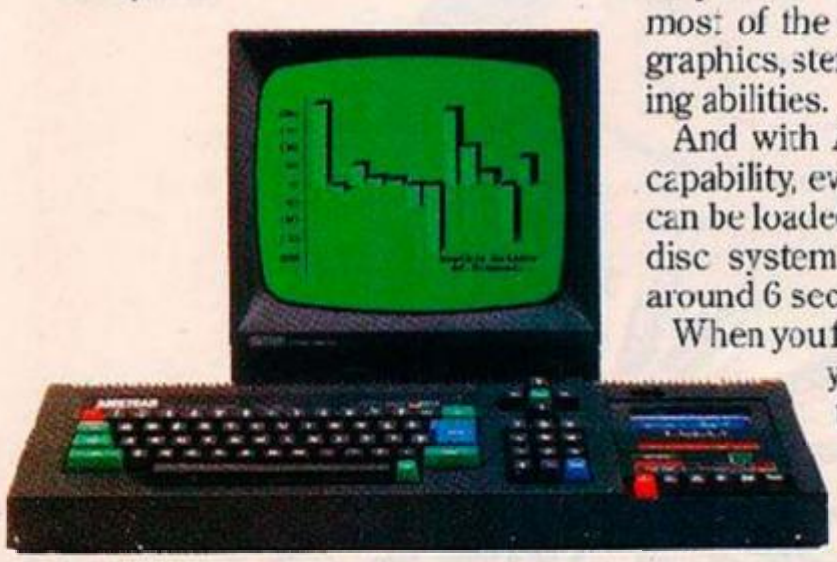
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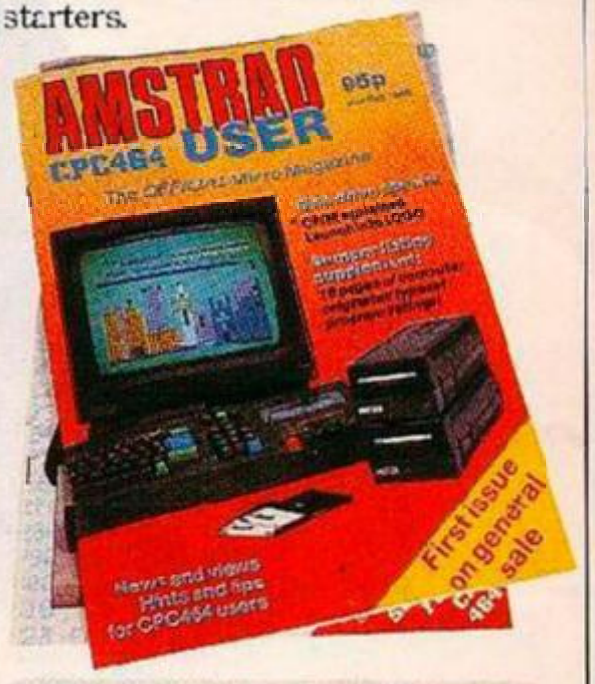
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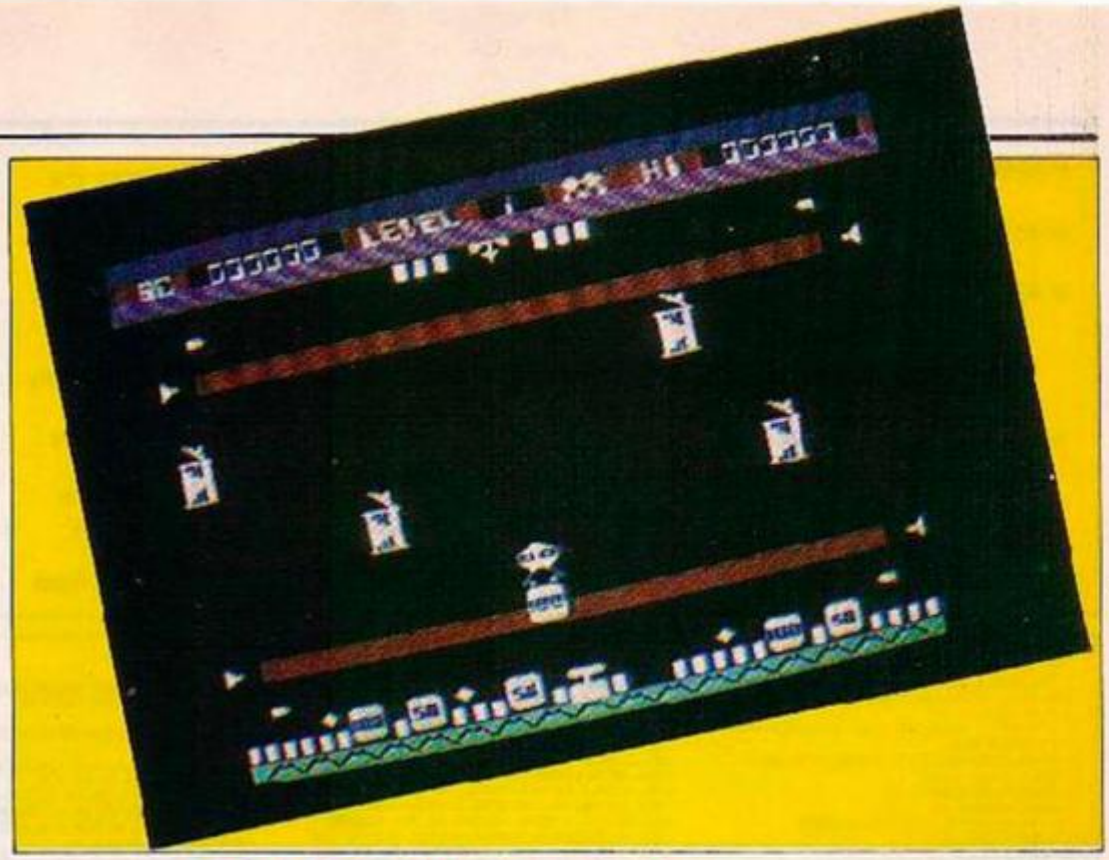
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Hard times at the space port. Float off with Jonathan Richards.

LIFE IS HARD at the spaceport, especially if you're the pilot of a balloon hopper, and especially now the spaceport has had a refit. What with the new intake of cargo and new processing techniques, it's a wonder I don't bite the spacedust more than I do

Way back in September 1983, there was a short program published in *Your Computer* called Balloon Hopper, by Andrew Foord. This well-presented little game had lots of potential and all it needed was someone to expand and develop the game. This all machine-code version for the Oric-1, called Hero-Zero, is the result.

Anyway, the control keys are Z and X — left and right — and ' and / — up and down. Drifting from left to right are various objects ranging from dustbins to ice-creams. At the bottom of the screen are cargo boxes sitting on swampy ground — yes, I know, there's no ground in space, but remember this is only a game. Located at each side of the screen are two sets of pods or conductors. These "arc" across at regular intervals and remain on for the same amount of time as they are off.

At the centre of the top of the screen is a type of homebase. This is where Hero-Zero needs to go in order to collect the points from the cargo. In each corner of the screen are spikes which deter movement around the perimeter. In the centre of the swampy ground is a button. The idea is that you can stop the arcing of the pods by picking up a seed from the cargo area, taking it up to the homebase then pressing down the button. On levels 1 to 4 this gives 17 seconds relatively free movement and on level 5, 10 seconds and level 6, eight seconds.

Just to remind you, the idea of the game is that you control Hero-Zero around the screen picking up cargo and taking it to the top of the screen.

16K Oric owners cannot use the program unless serious modifications are carried out. Even so, a 16K version is available on tape if you specify this.

The hexdumps shown consist of the data code — #8000 to #9050 — and the game code — #9F00 to #AC30. To start entering in the hex you can use the hexloader shown or alternatively, you can use what I used. This was to enter the disassembler and save it to tape, then add the following lines:

```
20000 FOR I = start TO finish
20010 PRINT HEX$(I), INPUT A:POKE ,A
20020 NEXT I
```

I would then Run 20000, and then start or continue typing in the hex, stopping at regular intervals to check for errors using the hexdump or disassembler

Once the data has been typed in you can save it to tape using:

```
CSAVE"DATA",A#8000,E#9050
```

Again, once the code has been typed in you can save it to tape using:

```
CSAVE"CODE",A#9F00,E#AC30
```

If you think it's relatively bug free now, then you can start the game by typing:

```
CALL#8FF5
```

As usual, tapes are available for £3.00 which contain Hero-Zero, the disassembler and the hexloader. A leaflet is also supplied giving details of the Oric Rom routines and how to use them.

Make cheques or postal orders payable to Jonathan Richards, and send them to Prosoft, 12 Mendip Close, Great Sutton, South Wirral, Cheshire L66 4SE.

Table 1. Zero Page Variables.

Note: All values are given in hexadecimal

- #67 — HZ Horiz Counter.
- #68 — HZ Vert Counter.
- #69 — No of aliens on screen (NOAS).
- #6A — NOAS Replica.
- #6B — Toggle Location.
- #6C — Cargo Screen add. LSB.
- #6D — Cargo Screen add. MSB.
- #6E — Cargo Data add. LSB.
- #6F — Cargo Data add. MSB.
- #70 — Aline one screen add. LSB.
- #71 — Alien one screen add. MSB.
- #72 — Alien two screen add. LSB.
- #73 — Alien two screen add. MSB.
- #74 — Alien three screen add. LSB.
- #75 — Alien three screen add. MSB.
- #76 — Alien four screen add. LSB.
- #77 — Alien four screen add. MSB.
- #7E — Alien Data add. LSB.
- #7F — Alien Data add. MSB.
- #80 — HZ Screen add. LSB.
- #81 — HZ Screen add. MSB.

Table 2. Hero-Zero data breakdown.

		Bytes
#8000-#8438	Titlescreen	1080
#8440-#8878	Gamescreen	1080
#8900-#8BF0	Character set	752
#8BF1-#8C20	Dustbin chars	47
#8C21-#8C50	Tardis chars	47
#8C52-#8C81	Clock chars	47
#8C82-#8CB1	Balloon chars	47
#8CB2-#8E08	Icecream chars	47
#8CE1-#8D10	Cup chars	47
#8D11-#3D61	Level 1 Cargo	80
#8D62-#8DB2	Level 2 Cargo	80
#8DB3-#8E03	Level 3 Cargo	80
#8E04-#8E54	Level 4 Cargo	80
#8E55-#3EA5	Level 5 Cargo	80
#8EA6-#8EF6	Level 6 Cargo	80

```
1 REM *** HEXLOADER ***
2 REM (c) PROSOFT 1984
3 REM
4 REM USE '(' TO DECREMENT ADD
5 REM USE '2' TO END
6 REM
10 CLS:PAPER4:INK7
15 GOSUB1000
20 PRINT:PRINT"                HEX-LOADER"
30 PRINT:PRINT:INPUT" ENTER START ADDRES
S   ";S:IFS<DEEK(#FFFF)THENGOTO10
40 PRINT:INPUT" AND THE END ADDRESS   "
E:IFE<DEEK(#FFFF)THENPRINTCHR$(7):GOTO40
45 CLS:PRINT:PRINT"START - "HEX$(S)
46 PRINT"END   - "HEX$(E):PRINT:PRINT
47 DOKE621,48168:POKE623,25:CLS
50 FORX=STOE
60 PRINTHEX$(X)"    ";:INPUTH$
70 DTA=0
75 IFH$=""THENX=X-2
76 IFH$="1"THENPRINT:PRINT:PRINT"COMPLE
TE":DOKE621,46000:POKE623,27:END
80 IFLEN(H$)<>2THENGOTO60
100 L$=LEFT$(H$,1):R$=RIGHT$(H$,1)
110 FORJ=0TO15
111 B$=A$(J)
115 IFB$=L$THENDTA=DTA+16*J
120 IFB$=R$THENDTA=DTA+J
130 NEXTJ
140 POKEX,DTA:NEXTX
150 DOKE621,48000:POKE623,27:END
1000 DIMA$(15)
1010 FORN=0TO9:A$(N)=RIGHT$(STR$(N),1):N
EXT
1020 FORN=10TO15:A$(N)=CHR$(N+55):NEXT
1030 RETURN
```

Table 3.

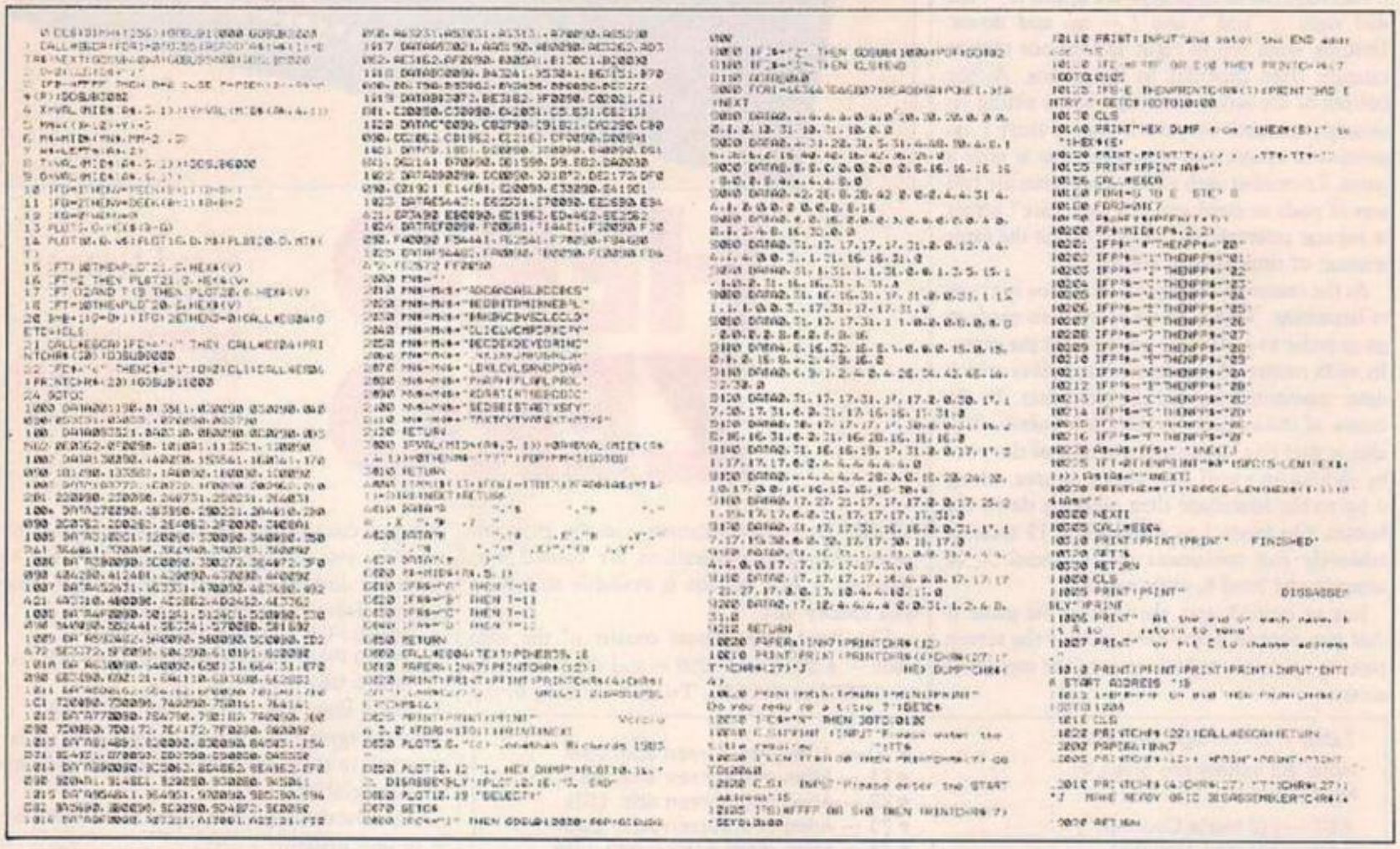
- #8FF5-Startup — Loads the character set and the titlescreen. Waits for space bar to be pressed and starts initialisation, then jumps to main routine loop.
- #9F00-Mainloop — Calls service routines and monitors timing for aliens and arcs.
- #9FE1-Movement — Detects key press and moves HZ around the screen.

(Table 3 continued on next page)

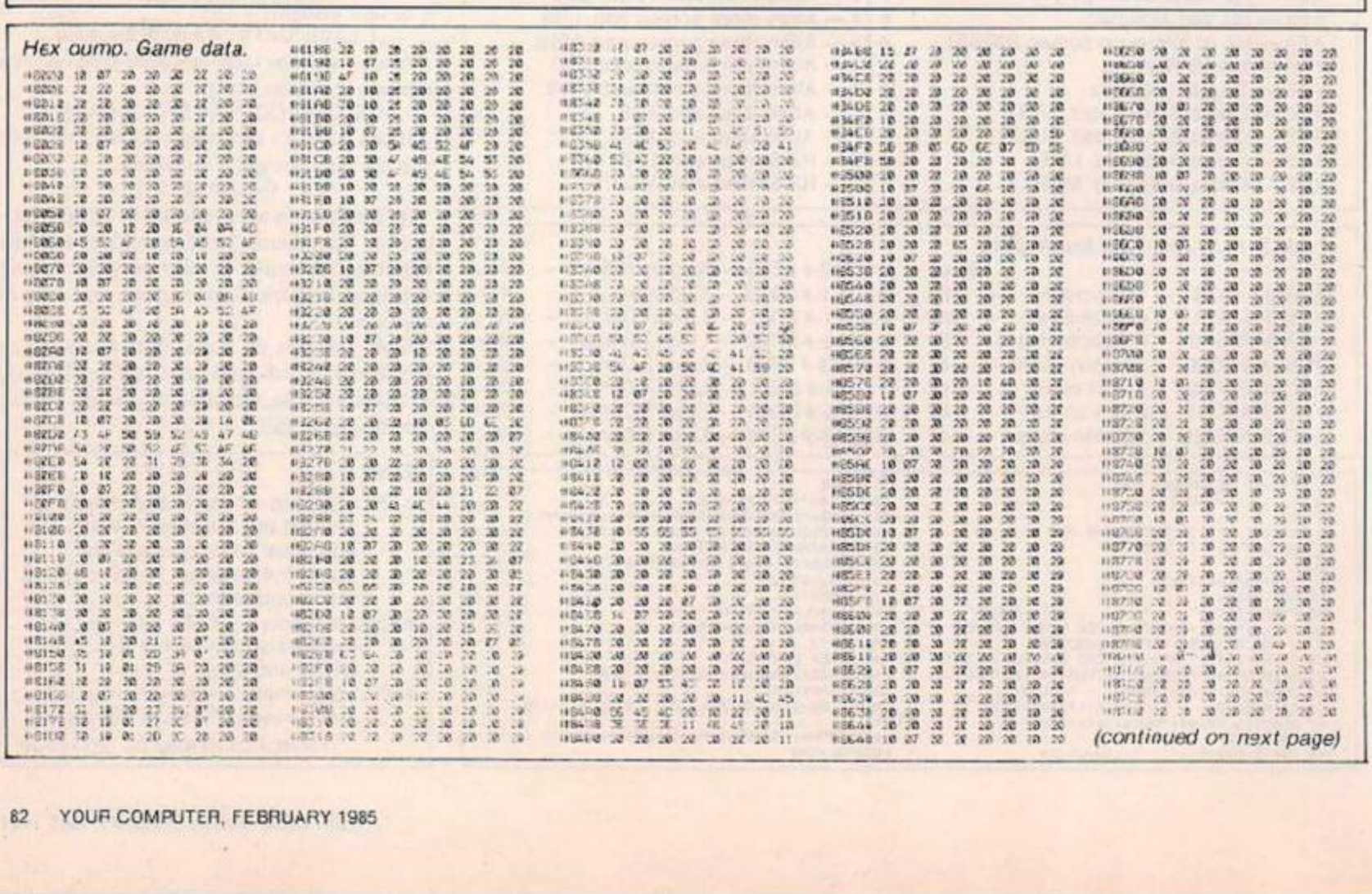
(Table 3 continued from previous page)

Uses # 208 for reading keyboard.

- # A15E-Pickup – Checks to pickup something and prints it below HZ.
- # A25F-Movealien – Prints four aliens in 2 by 3 format at various positions around the screen. Collects data for characters from HZ buffer — # BFE0 – # BFFF.
- # A450-Window – Checks for HZ moving off the screen in the four directions. Copes for HZ with cargo.
- # A600-Printarc – Prints arcs onto the screen.
- # A60D-Wipearc – Wipes arc from the screen.
- # A640-Setup – Initialisation routine that puts HZ variables and characters into memory locations
- # A723-Arckill – Checks when HZ crosses the arc boundary.
- # A742-Inc50 – Increments the score by 50.
- # A752-Inc100 – Increments the score by 100.
- # A762-Plus1 – Increments the score variables by 1 in BCD. Used by Inc50 and Inc100.
- # A77EE-PrntSC – Converts score from BCD to ASCII code and prints this to the screen.
- # A7C4-Compare – Determines whether current score is higher than the high score.
- # A804-PrntHI – Prints high score onto the screen and uses the same techniques as PrntSC but for a different part of the screen.
- # A8CA-Dwnlcchr$ – Down loads the new character set.
- # A8E6-Dwnldtitle – Down loads the title screen.
- # A902-Dwnldgme – Down loads the game screen.



Hex dump. Game data.



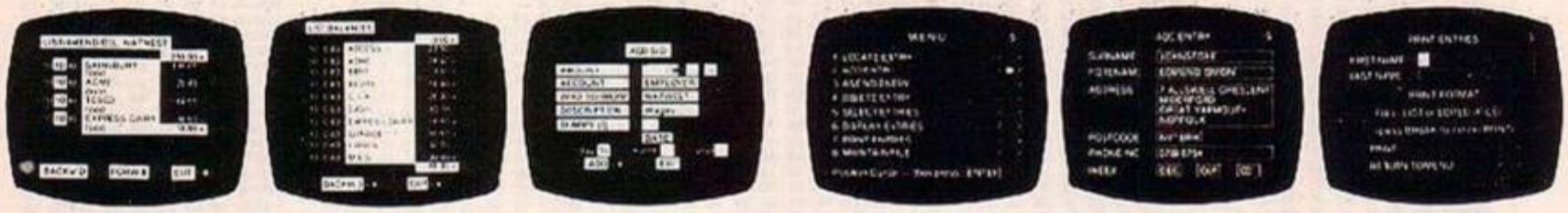
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Main code.

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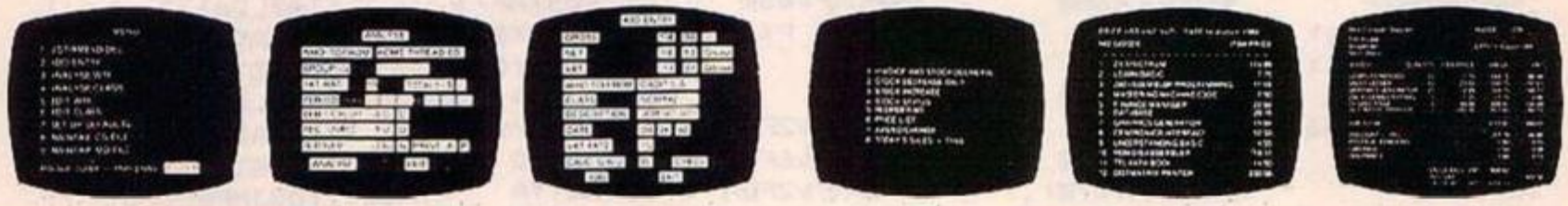
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Our Utilities include: Machine Code Test Tool, Editor/Assembler and Master Tool Kit.

Program 2.



Program 1.



THE IDEA OF this game is to cross the screen and collect the bags of swag and return with them to the get away car. You will be hampered by falling bombs and aided by stone defences. Each level more bombs will fall and after a specified number of points either one or two blocks will be renewed. Also on each level the program will play a new tune — it knows four different ones.

The program is in three parts, though there are four parts to type in. The first part loads the others and sets up the UDG's and Envelopes. The second part makes the machine code and stores the multi-coloured characters. The final part is the Basic program.

Typing in the program is done as follows:

Type in program 1 and save it as "Holdup". Now type in program 2, Run it, type New and enter program 3 and Run it. Now save the code made by these programs with:

*SAVE Hold-Up 2381 2FFF

Now type in program 4 and save it as "Hold-Up".

When loading the program make sure the DFS is disabled as the program sets Page to &D00.

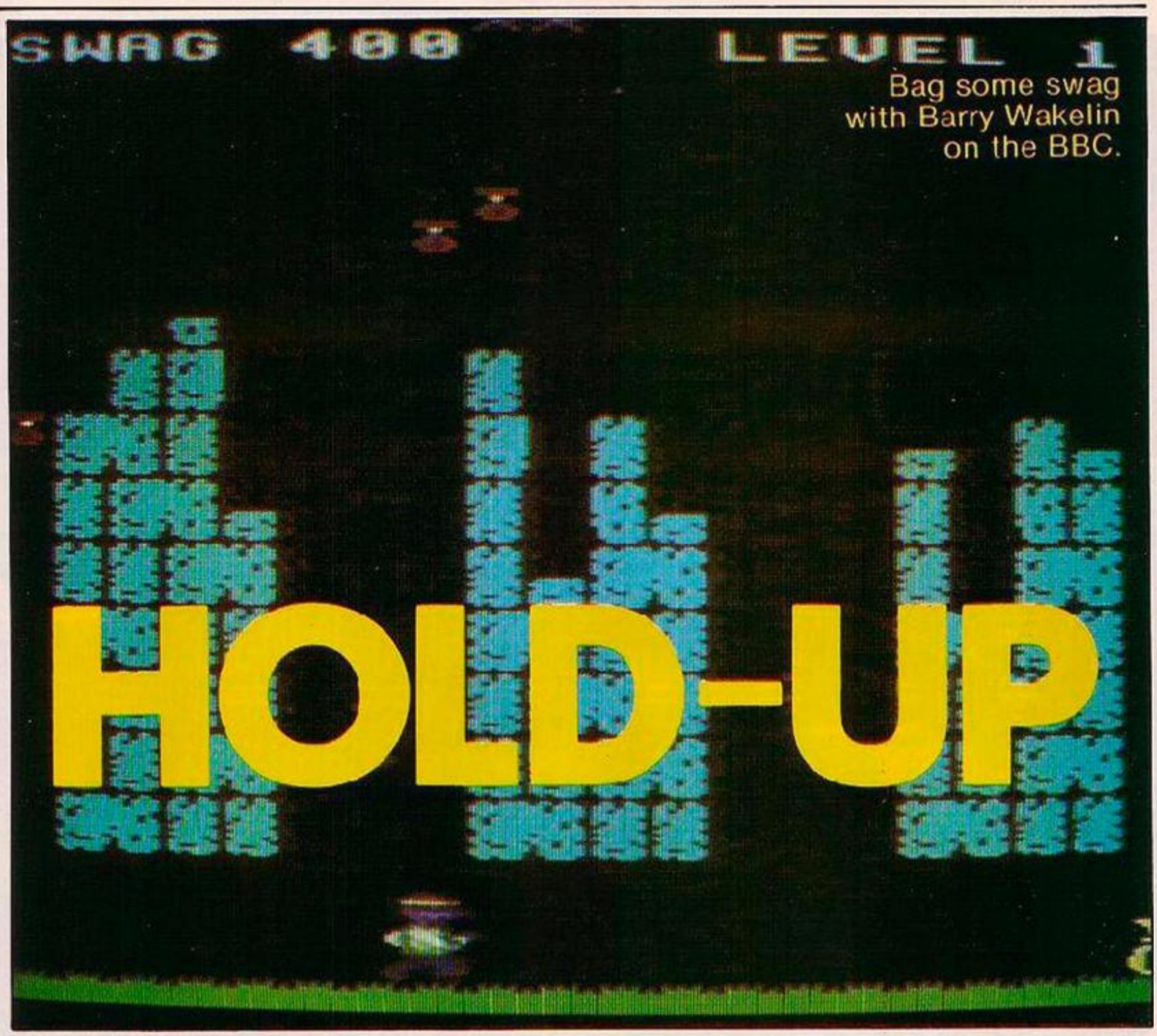
Storing high and low bytes for the machine code is made easier and quicker by directly accessing the resident integer variables. These variables are stored from &400 onwards and each one takes up four bytes. So A% is at &400, B% is at &404 and so on.

When the game isn't being played the computer will show either the high score table or the instructions. These will be flicked between when the scrolling message at the top of the screen is finished. To toggle between them at any time press Escape.

To change the difficulty of the game press C on one of the above screens.

Program 3.

```
10MODE1:HI
  MEM=&2980
20P%=&2F01
30[
40LDY#&1F
50LDA&2FE0,Y
60STA(&70),Y
70DEY
80BPL P%-&06
90RTS
100BRK
110LDY#&1F
120LDA#&00
130STA(&70),Y
140DEY
150BPL P%-&03
160RTS
170BRK
180LDA#&E0
190STA&70
200LDA#&7A
210STA&71
220LDA#&00
230STA&6F
240LDY#&00
250LDA(&70),Y
260CMP#&01
270BEQ P%+&1C
280SEC
290LDA&70
300SBC#&20
310STA&70
320LDA&71
330SBC#&00
340STA&71
350CMP#&34
360BNE P%-&17
370LDA&70
380CMP#&E0
390BNE P%-&1D
400JMP&2F7A
410JSR&2F0D
420CLC
430LDA&70
440ADC#&80
450STA&70
460LDA&71
470ADC#&02
480STA&71
490LDY#&00
500LDA(&70),Y
510CMP#&14
520BEQ P%+&15
530JSR&2F01
540SEC
550LDA&70
560SBC#&A0
570STA&70
580LDA&71
590SBC#&02
600STA&71
610JMP&2F39
620JSR&2F0D
630INC&6F
640JMP&2F61
650BRK
660LDA#&00
670STA&70
680LDA#&7B
690STA&71
700LDY#&00
710LDA(&70),Y
720CMP#&01
730BEQ P%+&1B
740CLC
750LDA&70
760ADC#&20
770STA&70
780LDA&71
790ADC#&00
800STA&71
810CMP#&7D
820BNE P%-&17
830LDA&70
840CMP#&80
850BNE P%-&1D
860RTS
870BRK
880JSR&2F0D
890INC&6F
900JMP&2F8A
910BRK
920LDX#&03
930LDY#&3F
940LDA(&74),Y
950STA(&72),Y
960DEY
970BPL P%-&05
980CLC
990LDA&72
1000ADC#&80
1010STA&72
1020LDA&73
1030ADC#&02
1040STA&73
1050CLC
1060LDA&74
1070ADC#&40
1080STA&74
1090LDA&75
1100ADC#&00
1110STA&75
1120DEX
1130BNE P%-&24
1140RTS
1150]
1160P%=&2B01
1170[
1180SEC
1190LDA&72
1200SBC#&08
1210STA&72
1220LDA&73
1230SBC#&00
1240STA&73
1250LDX#&03
1260LDY#&38
1270LDA(&72),Y
1280CMP#&01
1290BEQ P%+&3A
1300TYA
1310SEC
1320SBC#&08
1330TAY
1340BPL P%-&0B
1350LDA&0420
1360BEQ P%+&2D
1370CMP#&08
1380BEQ P%+&2D
1390CLC
1400LDA&72
1410ADC#&08
1420STA&72
1430LDA&73
1440ADC#&00
1450STA&73
1460LDX#&03
1470LDY#&00
1480LDA(&72),Y
1490CMP#&03
1500BEQ P%+&13
1510CLC
1520LDA&72
1530ADC#&80
1540STA&72
1550LDA&73
1560ADC#&02
1570STA&73
1580DEX
1590BNE P%-&14
1600RTS
1610INC&76
1620RTS
1630CLC
1640LDA&72
1650ADC#&48
1660STA&72
1670LDA&73
1680ADC#&00
1690STA&73
1700JMP&2B35
1710BRK
1720LDA#&E0
1730STA&70
1740LDA#&7A
1750STA&71
1760LDY#&00
1770LDA(&70),Y
1780CMP#&01
1790BEQ P%+&1A
1800SEC
1810LDA&70
1820SBC#&20
1830STA&70
1840LDA&71
1850SBC#&00
1860STA&71
1870CMP#&34
1880BNE P%-&17
1890LDA&70
1900CMP#&E0
1910BNE P%-&1D
1920RTS
1930JSR&2F0D
1940JMP&2B71
1950]
```

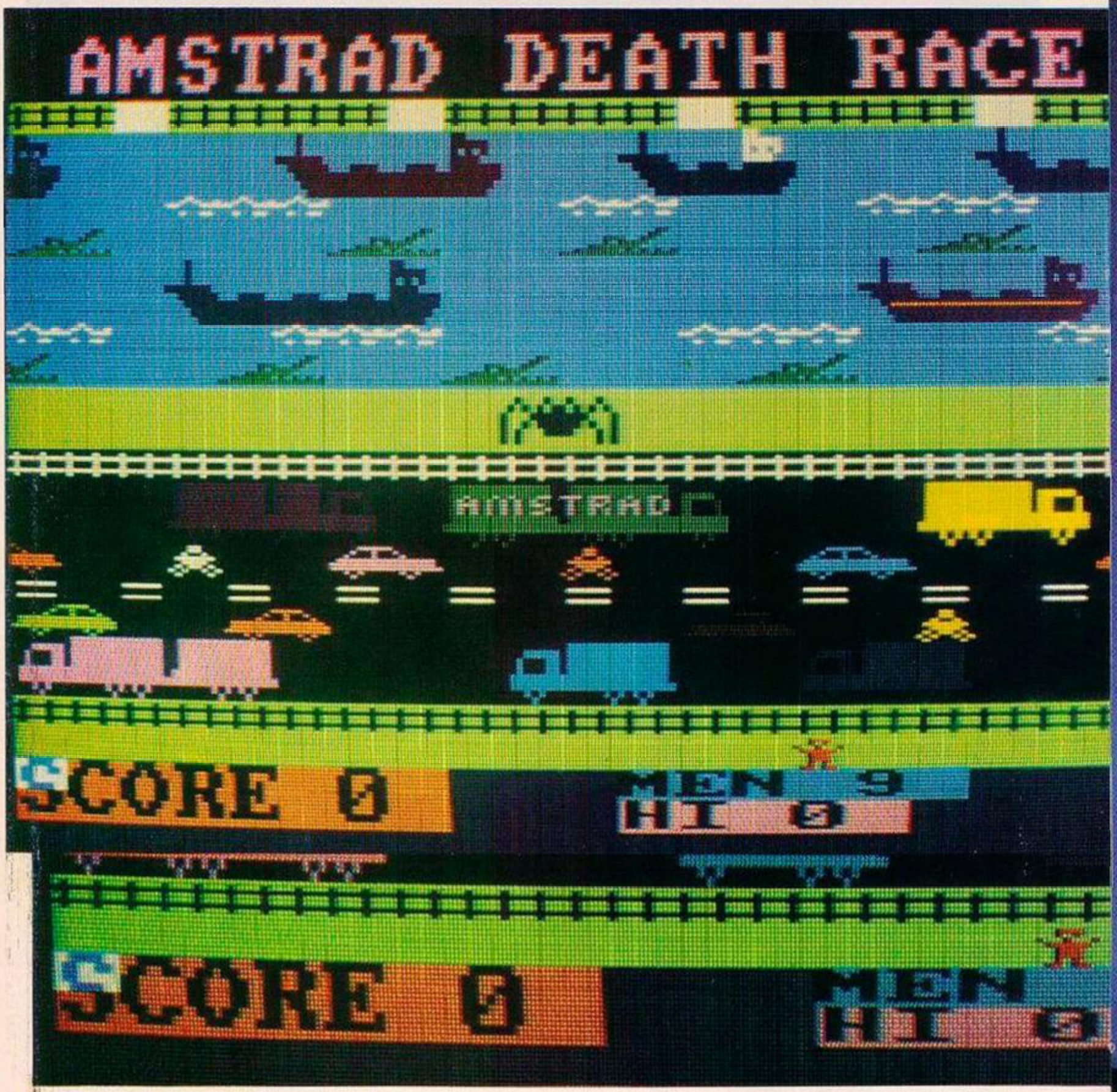


Bag some swag with Barry Wakelin on the BBC.

HOLD-UP

Program 4.

```
   10*FX14,4
   20*FX229,1
   30REM Leave out lines 10 & 20 until the program is
debugged
   40MODE2:X%=&2900
   50PROCinit:GOTO220
   60REPEAT:I%=0:FORJ%=1TO5:VDU19,J%,8;0;:NEXT:SX=0:LEVX=1:
LIVX=3:ANIM=0:PROCdraw:REMVDU23,23;0;0;0;0;:PRINTSTRING$(20,CHR$236);
VDU4,23,1,0;0;0;0;:ON+GOTO:ON+GOSUB:IF%=0:PROCbik(1):PROCbik(0)
:PROCbik(15:VDU20
   70VDU19,8,1;0;:COLOUR:PRINTTAB(2,1)"SWAG "SX;TAB(
12,1)"LEVEL "LEVX:PROCdraw:IX=0:PROCmob(IX):YX=0:RESTORE+(LEVX*D04)+20+570:
   80FORJ%=0TO3:READA%:IFA%<0THENJ%=A%:A%=0ELSEIFA%=-1THENJ%=
   90EV=-A%:ONEVGOTO100,110,120,130:GOTO90
   100FSX=0:ANDA%=&7000:G%=1:GOSUB600:I,4,5,5:VX=RND(95
)+80:GOSUB600:PRINTAB(I/,29:I%;
   200FSX%=ANDX%+17600:X=0:GOSUB600:I,4,40,5:PROCsetup(X%)
:PRINTTAB(19,29:I%;
   300FAX=>V%<&7000ORAX>=C%:&7020+C%=0
   400%72=%404:%73=%405:CALLchk%:IF%%71)0GOTO178
   500IFX%=0ORI=1TO5:NEXT:GOTO80
   600X=(CX+1)*800:A%=A%-HX:%72=%40+:%73=%405:%74
=M%(CX+2%):ANDAF1=%75=MX-CX+2%):D)256:CALLaabb%:GOTO80
   700CALLcl%:%72=%404:%73=%405:%74=&31:%75=&29:
FORI=1TO2500:NEXT:BX=AX-9:A%=&7600
   800SOUND1,-1,16,78:REPEAT:%72=%40+:%75=%405:%74
=&41:%75=&38:CALLmax%:A%=A%+8:FORI=1107B:NEXT:IFA%>BX
FORI=1TO200:NEXT
   900NEXT:A%=&7A8F:FORI%=0TO5:PRINTTAB:PRINTTAB(19,I% *  ":N
EXT
   1000LIVX=LIVX-1:IFLIVX=0GOTO220
   1100GOTO70
   1200PROCtune(5,0,8):FORI=1TO4000:NEXT:MODE7:M%=&2900
:VDU23,1,1,8;0;0;0;:IFSX>HI%OHI%=SX:GOTO270
   1300FORI%=1TO2:PRINTTAB(12,I%)CHR$14 CHR$136"NEW HI-S
CORE"+STR$(LEVX+*):*R%=9:REPEAT:RX=RX-1:UNTI
LR%=1OR+HI%(R%-1 >SX:FORI%=0TO2%+13STEP-1:HI$(I%-+HI$(I%
-1):HI(I%)=HI%(I%-1):NEXT
   1400HI$(R%)=N$ HI%(R%)=SX:X%=1
   1500FORI%=1TO2*PRINTAB(5,I%)CHR$141CHR$132CHR$15
7CHR$131TAB(31,I%)CHR$156;NEXT:Y%=0:PRINTTAB(0,5);:GOS
UB320:*FX15,1
   1600REPEATY%=Y%+1:G%=1+KEY(0):IFQX=83GOSUB360
   1700IFQX=81GOSUB342
   1800FORI%=1TO2:PRINTTAB(9,I%)MID$(I$,Y%,20):NEXT:FORI
=1TO4:SOUNDRND(4)+1,RND(5)+RND(5)-2,RND(255),RND(4):NEXT
   1900UNTILQX=32ORQX=-%:IFQX=-%:I=1:GOSUB410:GOTO60
   2000IFQX=67THENSOUND0,0,24,39,5:CLS:IFX%=1GOSUB410:VDU26:RET
URN
   2100GOSUB500:VDU20:RETURN
   2400*FX210,1
   2500RETURN
   2600*FX210,0
   2700RETURN
   2800PRINTINTC*R$128"Swag is worth "200 to "";MSX*100+100
;" per bag" CHR$134"Every ";BX;" one block is repla
ced" CHR$134"Every ";SX;" two blocks are replaced"
CHR$134"Every ";1X;" you increase one level"
   2900PRINTCHR$135"Every ";5X;" you receive an extra
life" CHR$129" C  to change any of the above" CHR$129
"  P  for "  for LEFT" CHR$129" X" or  >  for RIGHT" CH
R$129" S  or  0  for sound ON or OFF" CHR$131"PRESS "
SPACE  TO START GAME..."
   3000RETURN
   3100FORI%=1TO8 PRINTTAB(8,(I%-1)*2);"X"  "STRING$(20,
" ");"X";:NEXT:PRINTTAB(11,7);:FNHI$(I
X));:AD=20,(I%-1)*2:PRINT$ HI$(I%),3:;NEXT
   4200PRINTTAB(2,14)CHR$129" C  to change any values" C
HR$129" S  or  0  for sound ON or OFF" CHR$131"PRESS "
SPACE  TO BEGIN YOUR MISSION...":RETURN
   4300CLS:PRINTTAB(0,3)CHR$134"Maximum value of swag (3
to 20 * 100)"
   4400INPUTTAB(0,5)MSX:IFMSX<3ORMSX>20PROCerr(5):GO'044
0
   4500PRINTTAB(0,7)CHR$134"Swag needed for an extra blo
ck (10 to "CHR$134"100 * 100)"
   4600INPUTTAB(0,10)CBX:IFCBX<10ORCBX>100:PROCerr(10):G
OTO4500
   4700PROCerr(10):GO'0460
   4785IX=EX+2:*RINTAB(0,12 CHR$133"Swag needed to in
crease a level (10 to "CHR$133"100 * 100)"
   4800INPUTTAB(0,14)LX:ILX=ILX+100:IFILX<MSX*100ORILX>
10000PROCerr(10):GO'0480
   4900LX=ILX+2:*SX=BSX-1:PRINTTAB(0,17)CHR$131"In this
 curse,I ?"
   5000*GET$:IF$="Y"VDU7:GOTO500
   5100*GET$:IF$="N"GOTO230
   5200GOTO220
   5300DEFPROCerr(IX):IFIX=10ANDLIX<MSX*100:UX(LX=1%ANU
LIX<MSX*100:PRINT CHR$129"That's less than you can get
in a week":GOTO550
   5400PRINT CHR$129"Out of range."
   5500VDU7:PRINTCHR$129"Try again..."*FORI=1TO3000:NEXT
:PRINTTAB(0,13)SPC(160):CHDP*10G
   5600DATA57,4,49,4,41,4,33,4,25,8,69,8,61,16,53,16
   5700DATA61,4,69,4,73,2,69,2,61,4,25,2,25,2,37,2,41,2,
41,4,53,4,61,4,69,4,69,2,61,2,53,4,25,2,31,2,25,4,21,4
,13,4,5,4,1,2,13,2,1,4,49,4,61,4,49,4,61,1,49,4,33,4,4
1,2,25,2,13,4
   5800DATA1,4,13,4,13,4,13,4,61,4,61,2,69,2,61,2,53,2,
45,4,61,4,49,4,61,4,41,4,53,4,49,2,41,2,33,4
   5900DATA61,6,53,6,61,6,69,6,53,4,69,6,61,6,45,6,53,6,
53,6,61,6,69,6,53,12,49,6,53,6,53,6,53,6,61,6,69,6,73,
6,69,6,61,6,53,6,49,6,53,6,41,6,49,6,53,12,53,6
   6000DATA4,6,49,6,41,6,33,6,41,6,49,6,53,12,61,6,49,6
,61,6,73,6,69,6,73,6,81,12,81,6,49,6,41,6,33,6,41,6,49
,4,53,6,41,6,33,6,53,6,49,6,61,6,53,12,53,8
   6100DATA6 ,2,53,2,49,2,53,2,69,4,33,4,81,8,61,8,89,4,
61,4,53,4,49,4,41,4,61,2,53,2,49,4,33,2,4 ,2,73,8,73,4
,81,4,73,4 81,4,60,4,89,8,89,4,97,8,69,8
   6200DATA47,2,41,2,49,2,53,2,61,4,33,4,81 8,77,8,69,4,
61,4,69,4,33,4,61,14
   6300DATA33,4,41,2,49,4,29,2,33,4,41,2,49,4,65,2,81,4,
33,2,49,4,41,2,61,8,61,4,49,1,33,4,21,4,33,4,21,4,33,1
2,29,2,33,4,41,2,49,4,29,2,33,4,41,2,49,4,69,2,61,4,33
,2,61,4,81 2
   6400DATA0 ,12,81,8,81,4,29,2,33,4,41,2,49,4,29,2,33,4
,41,2,49,4 69,2,61,4,33,2,49,4,61,2,61,8,41,4,53,4,49,
4,33,4,25,4,33,4,33,12
   6500%72=%404:%75=%405:%74= MX(CX-2% AND&FF):%75
- MX(CX-2% DIV256):CALLaabb%:RETURN
   6600DEFPROCture(EX,FX):RESTORE (:FORI=1TO2000:NEXT:F
ORIX=1TO3 READANT,JD%:SOUND1,5,RND,DOT:NEXT:ENDPROC
   6700DEFPROCaer(WX):DX=0:IFSX(BXANDSX+WX)=BXCALL(1):X
OANDSX=BX:2,2,100,1:DX=1+(DX=RND(3)*7-6:PROCbik(0%):BX
+EBX:IF(BX>EBX)/SBX+INT (BX-EBX)/SBX)REPEAT:DX=RND(3)
*-6:UNTILDX%(>DX:PROCbik(1%)
   6800IFSX(BXANDSX+WX)=BXCALL(1):X%DX=1:SOUNDRND13,3,4,3
2:DX=RND+3:LEVX=LEVX+1:I%=0:RESTORE (LEVX*D04)+20+570):
COLOUR0:PRINTTAB(10,1);LEV%;DX=DX+ILX:IF(JX-ILX)/SLX=I
N*(DX-ILX /SLX)LIVX=LIVX+1:PROClives
   6900SX=SX+WX:COLOUR7:PRINTTAB(5,1);SX;COLOUR6:IFDX=IF
ROCbomb(RX)
   7000ENDPROC
   7100DEFPROCbomb(UX):REPEAT:B=UX-1:PROCbams(1):CALLbab
%,UNTILUX%(1):ENDPROC
   7200DEFPROCbams(IX):*FX19,0,0,0,0,0:IFIX=0:COLOUR5:PRINTTAB(0,0)STRING$(20," "
:PRINTTAB(0,0)STRING$(IL VX-1,CHR$233):ENDPROC
   7300DEFPROCbik(KX):COLOURA:PRINTTAB(XX,7)A%+D%:F%=IX
+TO25STEP5:PRINTTAB(XX IX)B%A%+TAB(XX,I(-2)%B%A%TAB
(IX,I%-4)A%+B%:NEXT:ENDPROC
   7400DEFPROCbabs(NO):FORIX=1TONO:REPEAT:K%=RND(19)*32+
&34E8:UNTILK%X=0:%78=%42C:%71=%420:CALLrub%:NEXT:E
NDPROC
   7500DEFPROCinit
   7600IHM%(3*,H1$(0),H2$(0),FX(3:FORIX=1TO8:H1$(IX)="
SLY SAM(1':*HI%(IX)=500 NEXT:SX=0:FX(1)=5?:FX 2)=4):FX
   7700%(0):&2E40:M%(1)=&2D80:M%(2)=&2CC0:%13 =&2C20
   7800m8%=%2F1E:chx%=%2B84:ax%=&2FAC:ub%
=2F01:A%=CHR$224+CHR$225+CHR$10+CHR$8+CHR$8+CHR$227+C
HR$226+CHR$11:A%=CHR$22+CHR$10+CHR$8+CHR$229:CHR$11:S
$=CHR$231+CHR$10+CHR$8+CHR$232
   7900A="..... .....HOLD UP by Barry Wakelin.
 You, SLY SAM the bank robber, must collect the bags o
f swag thrown from the bank by your accomplices and re
turn to your base while dodging a downpour of bombs"
   8000B=A+".....":
   8100FX89,5
   8200*FX10,5
   8300A=" "+CHR$B+CHR$16+" "+ENDPROC
```



DEATH CHASE STARTED as a straightforward conversion attempt on a Spectrum program published by *Your Computer* some time ago. In the process some of the internal goings on of the Amstrad were revealed and the result is a playable and colourful game. This article gives the finished program and also details of screen display configuration and how to add extra commands to your Basic — lateral scrolling, enlarged printing and screen character reading.

In converting Spectrum Cross to Amstrad Death Race there were three fundamental problems to be faced. First the different size of the text screen, second the way the screen start moves around in memory, and third the way colour is mapped.

The Amstrad has three screen modes. Mode 2 is the high definition, two colour mode. Mode 1 is medium resolution with 40 columns of text in four colours. Mode 0 is the multi-colour mode with 20 column text. I decided to reduce the number of cars and lorries on the road to enable me to make the most of the colours.

Although the number of columns would be less than the Spectrum's, the number of lines available was more — 25 instead of 22. Since a double height printing routine has long been one of my favourites, the answer was obvious.

The screen display occupies the area of memory from hex & c000 up and is composed of 25 lines each with eight rows of 80 bytes. Some arithmetic tells you that there is a little memory left over at the end of the screen.

This fact, coupled with hardware scrolling of the screen when for example listing a program, means that the byte with address &c000 may not in fact be expected top left-hand corner. It could be anywhere, even off the screen altogether. However, after a mode change the screen is reset so that solves many of the problems.

Now supposing the top left hand corner is &c000 then we might expect the byte underneath to be &c050, but as on the Spectrum that is the top byte of the second line — pixel row nine. Thinking again and given that 25 lines times 80 bytes = &7d0 we might expect that second byte down to be &c7d0. In fact it is &c800. This tidy figure is arrived at by simply tagging roughly half a line on after the bottom of the screen.

Colour mapping is at its simplest in Mode 2. Here the eight pixel width of a character is matched by the eight bits in one byte. Hence 80 characters per line means 80 bytes across

```
10 '**********************************
20 '*                                *
30 '*        AMSTRAD DEATH RACE      *
40 '*                by              *
50 '*           C J LEIGH            *
60 '*                                *
70 '**********************************
80
90 ' after break run 150
100 GOSUB 10000:REM **machine code**
110 hs=0:GOSUB 9000:REM **graphics**
120 ENV 1,5,2,
130 ENV 2,10,-1,2
140 ENV 3,15,-1,10
150 GOSUB 3010 REM **instructions**
160 mem=%home=0:score=0:pause=100
170 GOSUB 7000 REM **screen**
200 REM **start**
210 PRINT,12:POKE &A45D,44
220 GOSUB 5000
230 ZONE 12:chr%=0:i=1=35
240 y1=23:col1%=12:x2=x1:y2=y1
250 LOCATE x1,y1:PEN 3:PAPER col1%:PRINT "P"
260 PEN 5:LOCATE 12,24:PAPER 10:PRINT "MEN";mem;
270 LOCATE 12,25:PAPER 9:PRINT "HI";hi;
280 LOCATE 1,24:PAPER 11:PRINT "SCORE";score,:PRINT,2
6
290 IF INKEY(0)=0 THEN 290
300 REM **loop**
310 IF INKEY(8)=0 THEN y2=y1-2
320 IF INKEY(1)=0 THEN x2=x1+1
330 IF x2>21 THEN x2=20
340 IF INKEY(8)=0 THEN y2=y1-1
350 IF x2=0 THEN x2=1
360 col2%=12-(7 AND y2)*3 AND y2<23)-(2 AND y2>3 AND y
2<12)*10 AND y2<3)
370 LOCATE x1,y1:PAPER col1%:PEN 3:PRINT " "
380 ILSCROLL,4,5,8,9,15,20,21
390 IFSCROLL,7,11,3,16,17
400 IF INDX0.5 THEN ILSCROLL,12,13,12,13 ELSE IRSCROLL
,2,13,12,13
420 IF home>3 THEN IRSCROLL,17:ILSCROLL,19
430 IF home>7 THEN IRSCROLL,7,1:
440 IF home>11 THEN IRSCROLL,15,16,7:ILSCROLL,12,20,2
1
450 IF home>15 THEN ILSCROLL,4,5,8,9:IRSCROLL,7,11
460 PAPER col2%:LOCATE x2,y2
470 CHR,&chr%:IF chr%<>32 THEN 1000
480 PEN 5:IF y2=5 THEN 2000
490 PRINT "P";REM chr&(208)
500 IF y2<y1 T4EN SOUND 2,30,20,15,2:score=score+5:LOC
A'E 1,24:PAPER 11:PEN 5:PRINT "SCORE";score:PRINT,2+
5.0 x1=x2:y1=y2:col=col2%
520 FOR N=1 TO pause:NEXT
530 GOTO 310
1000 REM **crash**
1010 SOUND 7,0,120,15,,,8,15
1020 men=men-1:IF men>0 THEN 200
1030 IF score>hi THEN hi=score
1040 LOCATE 1,22:PAPER 1:PEN 15:PRINT "     GAME OVER
     "
1050 PRINT "    Y for another.   "
1060 IF INKEY$="Y" OR INKEY$="y" THEN GOTO 150
1070 GOTO 1060
2000 REM **home**
2010 PAPER 4:PRINT "P";:GOSUB 3000
2020 score=score+55:home=home+1
2030 IF home/4=home\4 THEN GOTO 240
2040 POKE &A45D,00:GOSUB 7250
2050 FOR n=4 TO home STEP 4
2060 LOCATE RND*19,12:ICHR,&chr(:IF chr\<>32 THEN 2060
2070 PRINT "VW";REM chr&(244,245)
2080 NEXT
2090 IF home>16 THEN home=0:pause=2
2100 score=score+score\5
2110 GOTO 210
2000 REM **TUNE**
2010 RESTORE 2020
2020 DATA 255,,1,255,,1,190,,0 255,,85,190,,85,253,,85
,190,,85,190,1
2030 FOR N=1  TO NOTES:READ A,S:SOUND 2,A,100*S,8,1
2040 NEXT
2050 RETURN
2000 REM **KEY REDEFINE**
2010 RESTORE 2010:FOR n=1 TO 2 :READ a:KEY DEF a,1,%6+
n,n*n+n,n*n+n
2020 NEXT:RETURN
2030 DATA 47,54,,62,61,50,51,52,44,,75,45,,57,56,,58,46,54
,,77,47,,58,48,,51,49
2040 RESTORE 2010:FOR n=1 TO 2 :READ a:KEY DEF a,1,%6+
n,n*n+n,n*n+n
2050 NEXT n:RETURN
5000 REM **screen**
5010 INK 2,1:INK 1,2:INK 6,11:INK 7,4:INK 8,15:INK 9,1
1:INK 12,19:INK 13,9:INK 14,3
5020 MODE 0:POKE &A45F,00
5030 PAPER 5:PEN 1:PRINT " AMSTRAD DEATH RACE ":PRINT
:
5040 LOCATE 1,4:PAPER 10:PEN 5
5050 PAPER 10:PEN 5:PRINT "YZ    ";:PEN 8:PRINT"[YYZ
 ";:PEN 14:PRINT"]YYZ  ";:PEN 5:PRINT"X":PRINT 4:REM
CHR$(216,217,218),CONTROL+216
5060 LOCATE 2,4:PEN 4:PRINT CHR$(255);:LOCATE 1,4
5070 PEN 6:PRINT "   ITT    TT   TTT  ";:REM CHR$(212)
,CONTROL M
5080 PEN 13:PRINT "  [\    [\  [\    [\";:REM CHR$(219
,220),CONTROL [\
5090 PEN 7:PRINT "   YYYZ";:PEN 5:PRINT "    XY*YZ
";:PRINT,8
5100 FOR n=0 TO 12:POKE &4B8E+n,3:NEXT
5110 PEN 4:PRINT "TT   TTT   TTT   TT";
5120 PEN 13:PRINT "\\   \\    .\   \\ ";
5130 PAPER 5:PEN 15:LOCATE 1,14:PRINT "UUUUUUUUUUUUUU
UUUU";:REM CHR$(21),*
5140 PEN 13:PRINT "LMLMN   ";:PEN 11:PRINT "LMN    ";:P
EN 7:PRINT "LMMN ";:PRINT,15:REM CHR$(204,205,206),IFG
5150 PEN 11:PRINT "  O    ";:PEN 10:PRINT "HI   ";:PEN
8:PRINT "HI   ";:PEN 4:PRINT "O  ";:PEN 9:PRINT "HI";:R
EM AI & M
5160 PEN 4:PRINT "* * * * * * * * * *";
5170 PEN 14:PRINT "JK  ";:PEN 1:PRINT "O   ";:PEN 12:P
RINT "JK  ";:PEN 1:PRINT "O   ";:REM CR $ 9
5180 PEN 8:PRINT "  UPS   ";:PEN 9:PRINT "UPS";   ";
PEN 6:PRINT "UPS";:PRINT,2:REM * JK
5190 DATA 01,0e,,4,2,,0a,a4,,0d,d1,bc,,c9,00,00,00,00,1
c,,a4,c3,c7,,a4,c3,7b,,a4,c3,9c,,a4,c3,bd,,a4,c3,52,49,4e,d
4,4c,53,,43,52,44,4c,cc,52 53,45,52,44,4c,cc,43,48,d7,0
0
5100 DATA 0c,0e,,00,dd,23 dd,23,2d,26,,00,21,27,27,27,,e
5,d1,27,27,19,c9
5110 DATA cc,55,,44,11,00 00,19,,eb,21,50,00,19,,eb,0e,0
2,,e5,06,04,c5
5120 DATA 0e,02,,c5,,58,e5 d5,,0e,12,23,,5,10,fa
5130 DATA d1,2a,,eb,00,19 e1,0e,20,,ed
5140 DATA 7e,,e6,80,,67,c1 10,e1,d1,0d,20,dc,,c9
5150 DATA ,,cd,33,,e1,11 00,00,19,,0e,00,,c5,,e5,d1,,25,0
1,4f,00,,ed,,b0,12,,01,,b0 07,,09,,c1,10,,ee,,11,3d,20,,e0,,c
9
5160 DATA ,,cd,33,,e1,11 4f,,00,19,,0e,00,,c5,,e5,d1,,2a,0
1,4f,00,,ed,,b0,12,,01,,50 00,,09,,c1,10,,ee,,11,3d,20,,e0,,c
9
5170 DATA ,,cd,58,,bb,,e1,77,,c9
20000 REM **save**
20010 SPEED WRITE 1:SAVE "death race"
20020 SPEED WRITE 0:SAVE "death race"
20030 PRINT "rewind and CAT to verify"
20040 END
```



DEATH RACE

C J Leigh with a very colourful version of Frogger for the Amstrad.

the screen. Each bit reset is paper colour — usually pen 0 — and each bit set is usually pen 1.

In Mode 1 things are more difficult since the character width covers two display bytes with each pixel pen being represented by the state of two bits, so giving the four colours available. These bits are not consecutive but the byte is split in two with the most significant bit of each half representing the leftmost pixel of the byte.

In Mode 0 the same general idea is followed. The character width covers four bytes, each byte representing two pixels. The byte is split into four with the most significant bit of each quarter representing the left hand pixel of the pair. Each of the quarters contributes a bit to a 4 bit number with the bits weighted 1,4,2,8 indicating the pen number used.

Extensions to Amstrad Basic can be made very easily by setting up a name table and jump table as in listing 1 along with a four byte buffer and the log on routine at &a400. Each command must be preceded by a bar character available on the @ key.

The scrolling routines are straightforward whilst the double height printing routine is used after the Rom has printed to the screen. The machine code reads the bytes of colour off the screen and doubles them up. Screen character reading is done using a Rom system call.

Using machine code in this way is very attractive and is made even easier since it is possible to pass parameters from Basic to your own code and back again. These parameters are pointed to by the IX register pair with the number of parameters given in the A register.

In fact, the IX pair point to the low byte of the last parameter passed and is the base address of a parameter buffer set up for you by the system. If there is only one parameter it is available in the DE register pair and if the parameter is an integer variable preceded by @ then it is the address of the variable that is passed to the machine code. That allows values to be transferred back to Basic.

The graphics characters in the program listing may be entered most easily by entering and running the short routine at line 6000 first. This copies the Spectrum system of making the keyboard produce the appropriate graphic character when Control is pressed with one of the keys A to U.

The routine at 6040 returns the keys to normal if required. Follow the guidance of the

(continued on page 91)

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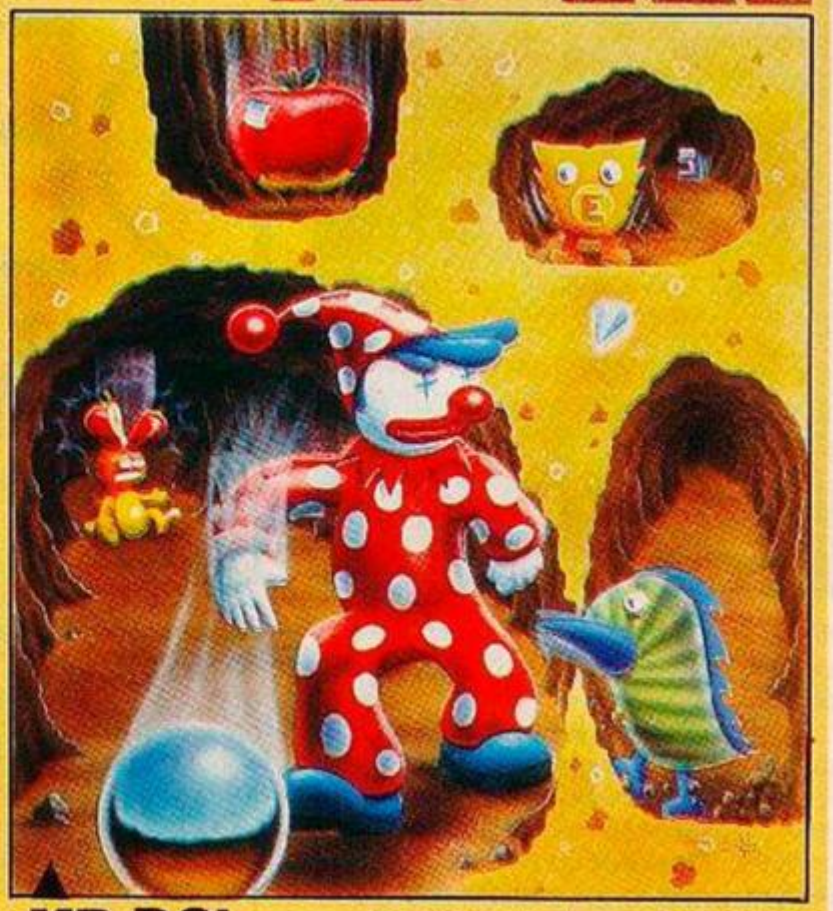
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(continued from page 89)

Rem statements when typing in the graphics. In addition you may find it easier to enter the machine code if you first enter Key 138,"," to change the decimal point on the numeric pad to a comma.

Finally, since the user graphics do not allow you to make the most of the Amstrad's colour, three different ways of going this have been introduced in the screen construction routine. They may be omitted if preferred since they slow down the screen printing.

To slow down the game increase the value of the pause used at the end of the main loop — set at line 160 — or to make it much easier remove some of the traffic. Every time you get four men home you will find extra spiders added and the speed will increase.

You can avoid the chore of typing in the program by sending £3 with your name and address to Death Race, 12 The Bassetts, Cashes Green, Stroud, Gloucestershire GL5 4SJ. Please make cheques payable to C J Leigh. ■

Listing 1.

```
                ORIGIN  A400H
010BA4  INITIAL LD BC,COMTAB
210A04          LD HL,BUFFER
CDD1BC          CALL BCD1H      ; tell the system
C9              RET
00000000BUFFER  DEFS 4          ; system work space
1CA4    COMTAB  DEFW NMETAB     ; command table
C347A4          JP PRINT
C37BA4          JP LSCROLL
C39CA4          JP RSCROLL
C3EDA4          JP CHR
505249  NMETAB  DEFM PRI        ; command names
4ED4            DEFM N,T+80H
4C534352        DEFM L,S,C,R
4F4CCC          DEFM O,L,L+80H
52534352        DEFM R,S,C,R
4F4CCC          DEFM O,L,L+80H
4348D2          DEFM C,H,R+80H
00              DEFB 0          ; end marker
DD6E00  ADDRESS LD L,(IX+0)     ; calculate screen start
DD23            INC IX
DD23            INC IX
2D              DEC L           ; start at line zero
2600            LD H,0
29              ADD HL,HL       ; multiply by two
29              ADD HL,HL
29              ADD HL,HL
29              ADD HL,HL
E5              PUSH HL
D1              POP DE
29              ADD HL,HL
29              ADD HL,HL
19              ADD HL,DE       ; times eighty
C9              RET
CD33A4  PRINT   CALL ADDRESS
1100F8          LD DE,F800H     ; bottom of first line
19              ADD HL,DE
EB              EX HL,DE        ; source
215000          LD HL,50H       ; move to next line
19              ADD HL,DE
EB              EX HL,DE        ; destination in DE
0E02            LD C,2          ; two lines
E5      HALF    PUSH HL
0604            LD B,4          ; four pixel rows
C5      ROW     PUSH BC
0E02            LD C,2          ; one row becomes two
0650    STRETCH LD B,50H        ; length of line
E5              PUSH HL
D5              PUSH DE
7E      NEXT    LD A,(HL)       ; read byte
12              LD (DE),A       ; write byte
23              INC HL
13              INC DE
10FA            DJNZ NEXT       ; next character
D1              POP DE
7A              LD A,D
D608            SUB 8           ; up a pixel line
57              LD D,A
E1              POP HL          ; recover read start
0D              DEC C
20ED            JRNZ STRETCH    ; do it again
7C              LD A,H
D608            SUB 8
67              LD H,A
C1              POP BC
10E3            DJNZ ROW        ; next read row
D1              POP DE          ; destination = source
0D              DEC C
20DC            JRNZ HALF       ; top half
C9              RET
F5      LSCROLL PUSH AF         ; save parameter count
CD33A4          CALL ADDRESS
1100C0          LD DE,C000H     ; start of top line
19              ADD HL,DE       ; screen address
C608            LD B,8
C5      BACK    PUSH BC
E5              PUSH HL
D1              POP DE
23              INC HL          ; HL to DE
014F00          LD BC,4FH       ; line length less one
1A              LD A,(DE)       ; save first byte
EDB0            LDIR            ; move line
12              LD (DE),A       ; wraparound byte
01B007          LD BC,7B0H
09              ADD HL,BC       ; next pixel row
C1              POP BC
10EE            DJNZ BACK
F1              POP AF
3D              DEC A           ; reduce parameter count
20E0            JRNZ LSCROLL    ; next line?
C9              RET
F5      RSCROLL PUSH AF
CD33A4          CALL ADDRESS
114FC0          LD DE,C04FH     ; end of top line
19              ADD HL,DE
0608            LD B,8
C5      AGAIN   PUSH BC
E5              PUSH HL
D1              POP DE
2B              DEC HL          ; HL to DE
014F00          LD BC,4FH
1A              LD A,(DE)
EDB8            LDDR
12              LD (DE),A
015038          LD BC,850H
09              ADD HL,BC
C1              POP BC
10EE            DJNZ AGAIN
F1              POP AF
3D              DEC A
20E0            JRNZ RSCROLL
C9              RET
D5      CHR     PUSH DE         ; save parameter address
CD608B          CALL BB60H      ; read screen character
E1              POP HL
77              LD (HL),A       ; put value in variable
C9      END     RET
END A4C3H
```

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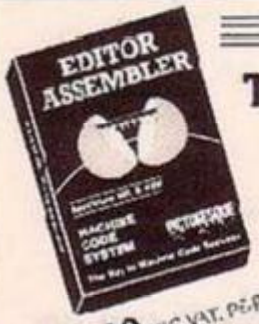
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TELSOFT



A reminder of how to use the Telsoft service.

THE PROGRAMS given here will enable Spectrum and BBC owners to download via *Your Computer's* Telsoft service. First type the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. On the BBC you call the service by entering

CALL &6A00

while Spectrum owners must type

RANDOMIZE USR 60000

So far OE Ltd's Telemod 2 and VTX 5000 modems have been tested with the service, but it also works with a number of other makes.

To find out what is available on Telsoft and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is available, make sure your modem is set up and dial the number appropriate to your modem's speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received, you will see "OK" printed if there were no errors, otherwise the program will wait for the blocks to come round again.

When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 MEMEF=&6FFF
20 CLS:PRINT
30 INPUT " START ADDRESS (Hex)";A$
40 A=EVAL("&"+A$)
50 IF A>&6F07 THEN 20
60 IF A<&2A00 OR A>&6FE7 THEN 20
70 PRINT ">A" ";
80 INPUT ":" B$,C$
90 IF LEN(B$) <>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$= MID$(B$,2*N+1,1): GOSUB 300
130 IF E=1 THEN 250
140 X$= MID$(B$,2*N+2,1): GOSUB 300
150 IF E=1 THEN 250
160 B= EVAL("&"+MID$(B$,2*N+1,2))
170 ?A=B:A=A+1:T=T+B
180 NEXT
190 FOR N = 1 TO LEN(C$)
200 X$=MID$(C$,N,1):GOSUB 300
210 IF E =1 THEN A=A-1: GOTO 260
220 NEXT
230 IF T<> EVAL("&"+C$) THEN 50
240 PRINT "CHECKSUM ERROR !"
250 A=A-8:GOTO 50
260 PRINT 'TYPING ERROR '"
270 A=A+(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6E07
290 END
300 E=0: IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6A00 :A9C8A0FEA20120F4,4C6
6A08 :FF20616C20485DC5,3BA
6A10 :3.F008C934F0F9C9,4C9
6A18 :35F0064C0C6A4C43,288
6A20 :6AA90C20E3FF39EE,4D2
6A28 :A000A2FF20F4FFA9,4F8
6A30 :03A20020F4FFA900,363
6A38 :A20220F4FFA920A0,4C8
6A40 :FEA20020F4FF50A9,48C
6A48 :0C20E3FF20F75BA9,439
6A50 :15A20120F4FF5000,3E9
6A58 :A9FF8D9985AF30FF,587
6A60 :A915A20120F4FF20,394
6A68 :05E2A9AF8D03A907,3D7
6A70 :6F0519DD8F7A90C,4A4
6A78 :20E3FF20A5A0A9A5,137
6A80 :A915A20120F4FF20,394
6A88 :4C6A60A47520B6C,2D2
6A90 :00DAFA200C6C200C,316
6A98 :6C4C4B4B4C6CAA9,336
6AA0 :2020E3FFA96F20E3,43D
6AA8 :FF/96020E3FF6009,51E
6AB0 :9CA000A60AE002D0,41E
6AB8 :EB025320F4FFA952,4F7
6AC0 :20F4FF601809A685,44F
6AC8 :0F047EA9914200,38D
6AD0 :F4FFB009C887D005,448
6AD8 :A000A47A847B200C,2C9
6AE0 :A9C80F2917E20D56,477
6AE8 :C0C47B50C1D006C6,45A
6AF0 :B0E3C57AF00DA950,4CE
6AF8 :20E3FF20E7FF4C67,4BB
6B00 :6A200C6C00CFC57B,3C1
6B08 :F000A9582BE3FF4C,447
6B10 :676A20C76B20E7FF,429
6B18 :A573A0A900F956F,3F6
6B20 :A50AC982D0502807,419
6B28 :68A9C820556CA955,388
6B30 :20306EA95820556C,298
6B38 :A915A20120F4FF20,394
6B40 :F76DA471C000B985,385
6B48 :20E3FF20A5A0A9A5,137
6B50 :A915A20120F4FF20,394
6B58 :05E2A9AF8D03A907,3D7
6B60 :20006EA99620556C,2DE
6B68 :4C6A60A47520B6C,2D2
6B70 :6F0519DD8F7A90C,4A4
6B78 :20E3FF20A5A0A9A5,137
6B80 :A915A20120F4FF20,394
6B88 :05E2A9AF8D03A907,3D7
6B90 :20006EA99620556C,2DE
6B98 :4C6A60A47520B6C,2D2
6BA0 :00DAFA200C6C200C,316
6BA8 :6C4C4B4B4C6CAA9,336
6BB0 :2020E3FFA96F20E3,43D
6BB8 :FF/96020E3FF6009,51E
6BC0 :9CA000A60AE002D0,41E
6BC8 :EB025320F4FFA952,4F7
6BD0 :20F4FF601809A685,44F
6BD8 :0F047EA9914200,38D
6BE0 :F4FFB009C887D005,448
6BE8 :A000A47A847B200C,2C9
6BF0 :A9C80F2917E20D56,477
6BF8 :C0C47B50C1D006C6,45A
6C00 :B0E3C57AF00DA950,4CE
6C08 :20E3FF20E7FF4C67,4BB
6C10 :6A200C6C00CFC57B,3C1
6C18 :F000A9582BE3FF4C,447
6C20 :676A20C76B20E7FF,429
6C28 :A573A0A900F956F,3F6
6C30 :A50AC982D0502807,419
6C38 :68A9C820556CA955,388
6C40 :20306EA95820556C,298
6C48 :A915A20120F4FF20,394
6C50 :05E2A9AF8D03A907,3D7
6C58 :20006EA99620556C,2DE
6C60 :4C6A60A47520B6C,2D2
6C68 :00DAFA200C6C200C,316
6C70 :6C4C4B4B4C6CAA9,336
6C78 :2020E3FFA96F20E3,43D
6C80 :FF/96020E3FF6009,51E
6C88 :9CA000A60AE002D0,41E
6C90 :EB025320F4FFA952,4F7
6C98 :20F4FF601809A685,44F
6CA0 :0F047EA9914200,38D
6CA8 :F4FFB009C887D005,448
6CB0 :A000A47A847B200C,2C9
6CB8 :A9C80F2917E20D56,477
6CC0 :C0C47B50C1D006C6,45A
6CC8 :B0E3C57AF00DA950,4CE
6CD0 :20E3FF20E7FF4C67,4BB
6CD8 :6A200C6C00CFC57B,3C1
6CE0 :F000A9582BE3FF4C,447
6CE8 :676A20C76B20E7FF,429
6CF0 :A573A0A900F956F,3F6
6CF8 :A50AC982D0502807,419
6D00 :68A9C820556CA955,388
6D08 :20306EA95820556C,298
6D10 :A915A20120F4FF20,394
6D18 :05E2A9AF8D03A907,3D7
6D20 :20006EA99620556C,2DE
6D28 :4C6A60A47520B6C,2D2
6D30 :00DAFA200C6C200C,316
6D38 :6C4C4B4B4C6CAA9,336
6D40 :2020E3FFA96F20E3,43D
6D48 :FF/96020E3FF6009,51E
6D50 :9CA000A60AE002D0,41E
6D58 :EB025320F4FFA952,4F7
6D60 :20F4FF601809A685,44F
6D68 :0F047EA9914200,38D
6D70 :F4FFB009C887D005,448
6D78 :A000A47A847B200C,2C9
6D80 :A9C80F2917E20D56,477
6D88 :C0C47B50C1D006C6,45A
6D90 :B0E3C57AF00DA950,4CE
6D98 :20E3FF20E7FF4C67,4BB
6DA0 :6A200C6C00CFC57B,3C1
6DA8 :F000A9582BE3FF4C,447
6DB0 :676A20C76B20E7FF,429
6DB8 :A573A0A900F956F,3F6
6DC0 :A50AC982D0502807,419
6DC8 :68A9C820556CA955,388
6DD0 :20306EA95820556C,298
6DD8 :A915A20120F4FF20,394
6DE0 :05E2A9AF8D03A907,3D7
6DE8 :20006EA99620556C,2DE
6DF0 :4C6A60A47520B6C,2D2
6DF8 :00DAFA200C6C200C,316
6E00 :6C4C4B4B4C6CAA9,336
6E08 :2020E3FFA96F20E3,43D
6E10 :FF/96020E3FF6009,51E
6E18 :9CA000A60AE002D0,41E
6E20 :EB025320F4FFA952,4F7
6E28 :20F4FF601809A685,44F
6E30 :0F047EA9914200,38D
6E38 :F4FFB009C887D005,448
6E40 :A000A47A847B200C,2C9
6E48 :A9C80F2917E20D56,477
6E50 :C0C47B50C1D006C6,45A
6E58 :B0E3C57AF00DA950,4CE
6E60 :20E3FF20E7FF4C67,4BB
6E68 :6A200C6C00CFC57B,3C1
6E70 :F000A9582BE3FF4C,447
6E78 :676A20C76B20E7FF,429
6E80 :A573A0A900F956F,3F6
6E88 :A50AC982D0502807,419
6E90 :68A9C820556CA955,388
6E98 :20306EA95820556C,298
6EA0 :A915A20120F4FF20,394
6EA8 :05E2A9AF8D03A907,3D7
6EB0 :20006EA99620556C,2DE
6EB8 :4C6A60A47520B6C,2D2
6EC0 :00DAFA200C6C200C,316
6EC8 :6C4C4B4B4C6CAA9,336
6ED0 :2020E3FFA96F20E3,43D
6ED8 :FF/96020E3FF6009,51E
6EE0 :9CA000A60AE002D0,41E
6EE8 :EB025320F4FFA952,4F7
6EF0 :20F4FF601809A685,44F
6EF8 :0F047EA9914200,38D
6F00 :F4FFB009C887D005,448
6F08 :A000A47A847B200C,2C9
6F10 :A9C80F2917E20D56,477
6F18 :C0C47B50C1D006C6,45A
6F20 :B0E3C57AF00DA950,4CE
6F28 :20E3FF20E7FF4C67,4BB
6F30 :6A200C6C00CFC57B,3C1
6F38 :F000A9582BE3FF4C,447
6F40 :676A20C76B20E7FF,429
6F48 :A573A0A900F956F,3F6
6F50 :A50AC982D0502807,419
6F58 :68A9C820556CA955,388
6F60 :20306EA95820556C,298
6F68 :A915A20120F4FF20,394
6F70 :05E2A9AF8D03A907,3D7
6F78 :20006EA99620556C,2DE
6F80 :4C6A60A47520B6C,2D2
6F88 :00DAFA200C6C200C,316
6F90 :6C4C4B4B4C6CAA9,336
6F98 :2020E3FFA96F20E3,43D
6FA0 :FF/96020E3FF6009,51E
6FA8 :9CA000A60AE002D0,41E
6FB0 :EB025320F4FFA952,4F7
6FB8 :20F4FF601809A685,44F
6FC0 :0F047EA9914200,38D
6FC8 :F4FFB009C887D005,448
6FD0 :A000A47A847B200C,2C9
6FD8 :A9C80F2917E20D56,477
6FE0 :C0C47B50C1D006C6,45A
6FE8 :B0E3C57AF00DA950,4CE
6FF0 :20E3FF20E7FF4C67,4BB
6FF8 :6A200C6C00CFC57B,3C1
```

Figure 1. Spectrum.

```
 5 REM SPECTRUM 48K        fig 1
10 REM Hex Code Loader
15 CLEAR 59999
20 POKE 23658,8: CLS : PRINT
30 INPUT "Start Address ";a
50 IF a>61135 THEN GO TO 200
60 IF a<60000 THEN GO TO 20
70 PRINT a;
80 INPUT " :";b$
85 IF b$="END" THEN GO TO 200
90 IF LEN b$<>200 THEN GO TO 200
100 LET t=a-256*INT (a/256)
110 FOR n=0 TO 7
120 LET x$=b$(2*n+1 TO 2*n+1)
125 GO SUB 300: LET y=x
130 IF e=1 THEN GO TO 260
140 LET x$=b$(2*n+2 TO 2*n+2)
145 GO SUB 300: LET y=y*16+x
150 IF e=1 THEN GO TO 260
170 POKE a,y: LET a=a+1
180 LET t=t+y: NEXT n: LET y=0
190 FOR n=1 TO 3
200 LET x$=b$(17+n TO 17+n)
205 GO SUB 300: LET y=y*16+x
210 IF e=1 THEN LET a=a-1: GO TO 260
220 NEXT n
230 IF t<>y THEN PRINT ";";b$: GO TO 50
210 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=8+INT (a/8): GO TO 50
280 SAVE "download"CODE 60000,1136
290 POKE 23650,0: STOP
300 LET e=0: LET x=CODE x$-48-7*(x$>"9")
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60200 :10EE12133E0812CD,340
60216 :D7ECCDA6ECC3AAEA,6B1
60224 :CD1FEDDAAAEA2170,518
60232 :EFBE20E121E5EE3A,524
60240 :A6EF056F3EE006C7,3CC
60248 :3E08BE208BCDD7EC,40F
60256 :3E2132885CC3FFEB,462
60264 :3E00326FEF3270EF,3C7
60272 :CD5E6DEF0600CD1F,40C
60280 :CDDAAAEA3273EFCD,634
60288 :EBEC3A68FFE0020,586
60296 :053A69EFE6003A73,432
60304 :EF12138C3A6AEF89,3FC
60312 :20DCCD1FEDDAAAEA,5DB
60320 :216FEFBEC22DEBCD,5B4
60328 :1FEDDAAAEA2170EF,5A2
60336 :BEC22DE93E6F32E2,589
60344 :EE36B32E30E3E00,490
60352 :32E4EE3A085CFE21,581
60360 :2803CD15EECDD7EC,553
60368 :CDA6EC2:E5EE3A68,5C5
60376 :EF056F3E000C673A,422
60384 :0021E5EEED4B66EF,561
60392 :0C7EFE00C2B0EA23,4FC
60400 :0D20F63EFACD04ED,589
60408 :1E21E5EEED4B66EF,561
60416 :.FED30FEC366EACD,5E9
60424 :1.FED30FBC3A0EAF3,594
60432 :0603AFD3FF10FB3E,3DB
60440 :3.D3FF3E0F320F5C,305
60448 :3280DC32485C3E01,258
60456 :D3FE2191SCCDAEF0,56B
60464 :CD50EDC366EACD15,52F
60472 :6.LD66ED3E01D3FE,556
60480 :2165EE3E00CD8FEC,442
60488 :CD84ECCDA3ECCDA6,654
60496 :EC23CD77ECCD77EC,58F
60504 :.CDA6ECCD84ECCDA6,661
60512 :EC233E0DCD8FECCD,4CF
60520 :81EC23CDA3EC3E03,498
60528 :CD8FECCD84ECC9CD,68B
60536 :A3EC3E07CD8FECC9,561
60544 :84EC23C97EFE00C8,520
60552 :CD88ED23C384ECFE,651
60560 :00C8F53E20CD8BED,538
60568 :F13DC38FECCDA0EC,65D
60576 :CDA3ECCDA6EC3E00,5A6
60584 :CD8BED3EFF320C5C,574
60592 :C9F513E6F0CB1FC8,60C
60600 :1FCB1FCB.FF630FE,4CF
60608 :3A1.AC66EC6071215,498
60616 :F.E60FF630FE3AFA,606
60624 :D4ECC607.213292!,46C
60632 :CBEEE5CD84ECE106,69C
60640 :.73E23772310"C3C,337
60648 :0077C9E52170IFNE,538
60656 :77C54E0B7EA7CB17,449
60664 :3B0D7EEE08773A6F,3C9
60672 :EFEE10526FEF3721,3D5
60680 :6FEFCD1623C01680,350
60688 :20E2C1E1C9110501,394
60696 :216A00CD8583C93E,32F
60704 :Y6327/2FCD47ED00,529
60712 :2EEDF1C366EACDAC,5C0
60720 :ED78E681F602D3FE,548
60728 :AF2177EF35200237,2FC
60736 :C9CD77CD3E0EC9CD,0F0
60744 :47EED0FECEC837C9,5E6
60752 :F5EBFF3A81EFFE00,5C7
60760 :D3FFCD50EDF1C93E,644
60768 :20243E1E1601823E37,187
60776 :B1EFFE002E043E36,376
60784 :D3FFCD50EDF1C93E,644
60792 :0000FFE60037C8D8,59.
60800 :FFE60237C0DAFFEA,62A
60808 :3020040B7FA7C93A,3E0
60816 :01EFFE002E043E37,397
60824 :1B023E36D3FFD97F,452
60832 :C9CD47ED3A73EFD8,5DE
60840 :F1C366EAF53ED23D,5EE
60848 :20FDF1C9CDACED3D,62A
60856 :20FAC9C5D5E5F5FE,780
60864 :7F2813CDF9EDFE0C,537
60872 :200CFE0D20053E20,2BA
60880 :D73E0D071B103E20,34F
60888 :D73E0807A0B5CFE,4E8
60896 :212003300ED73E5F,2E6
60904 :D73E8D7F1E1D1C1,610
60912 :C9FE0726ICFECD2B,4F3
60920 :19FE0C2014FE0D28,3D4
60928 :10FE0D20DCFE20FA,3e7
60936 :0FEEFE0DFA1EEE3E,40A
60944 :20C93E07C9CD6B0D,32C
60952 :3E02CD01163E1032,1C4
60960 :E95CC93E1216O1CD,302
60968 :1122C93E1216O0CD,257
60976 :1122C9C3D5E53E02,3EB
60984 :CD01:6CD47EE38FB,451
60992 :CD5CEEE1D1C1C93A,5CD
61000 :2D6CCD6F200C3A00,20F
61008 :5CF5213B6CC8AEF1,4C3
61016 :A7C937C9F5111000,3BE
61024 :CD1BEDF1C9444F57,486
61032 :4F4F4F4144494E47,284
61040 :204D454E55003120,216
61048 :2020524543454956,276
61056 :45003520202045?B,2:7
61064 :697420746F204261,32B
61072 :736963020205573,20F
61080 :6520537960626F6C,393
61088 :2053686966742020,30B
61096 :2047007468205265,2C9
61104 :?5?5?26E20746F20,39C
61112 :4D454E5520290045,27B
61120 :4E5455520045540,389
61128 :4245522000000003,1C1
```

SYCHEDELIA

A Light Synthesiser

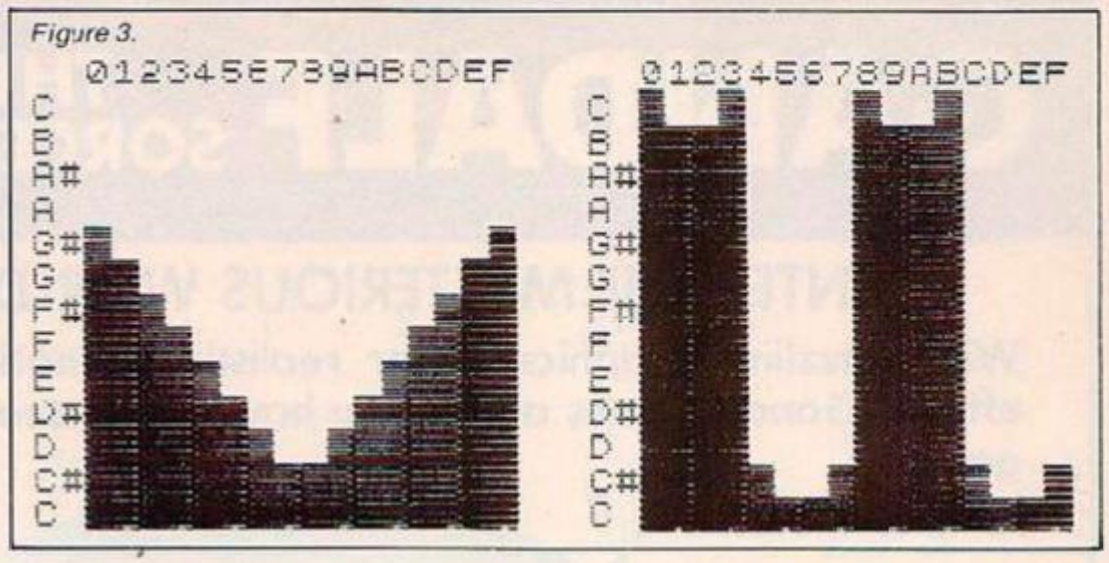




Figure 2.



Figure 3.



SYNSOUNDS

Tim Closs provides a useful facility on a machine not noted for its sound potential — the Spectrum.

THIS PROGRAM converts the 48K Sinclair ZX Spectrum into a versatile electronic keyboard. Up to 100 different sound effects can be synthesised by the user, any 10 of which can be accessed instantly while playing a piece of music. In addition, seven riffs can be stored in the memory and incorporated into the performance at the touch of a key.

Facilities on a main menu

All the facilities offered are obtainable from a main menu displayed at the start of the program:

- Play.
- Synthesise sound effects.
- Assign sound effects.
- Compose riffs.

Play: When this option is selected the screen is cleared and the computer keyboard is arranged as in figure 1. The labelled keys in the middle two rows are set out like a piano and can be played in a similar manner. However, three octaves are available since pressing Octave Down will lower all notes by one octave and Octave up will raise them. Hours of fun can be had from this basic electronic keyboard, even if your musical talent is strictly limited. But there's much more to come.

Synthesise sound effects: The essence of a synthesiser is to alter the kind of sound produced without altering the musical pitch of the notes themselves. On the Spectrum this can be achieved by causing a rapid change of frequency as the note is played: the particular "frequency waveform" governs the character of the sound emitted. In this program the user is able to invent as many as 100 unique frequency waveforms as follows.

On choosing menu option 2 you are first required to enter the number of the sound effect you are about to synthesise. This should be within the range 0-99. Having done this two axes will appear on the screen — see figure 2. The horizontal time axis covers the duration of the note, and is divided into 16 sectors, while the vertical axis represents frequency.

Beep returns you to menu

To draw out your frequency waveform keys 6 and 7 are used to move a bar up and down each sector and key 0 enters the desired level

(continued on page 97)

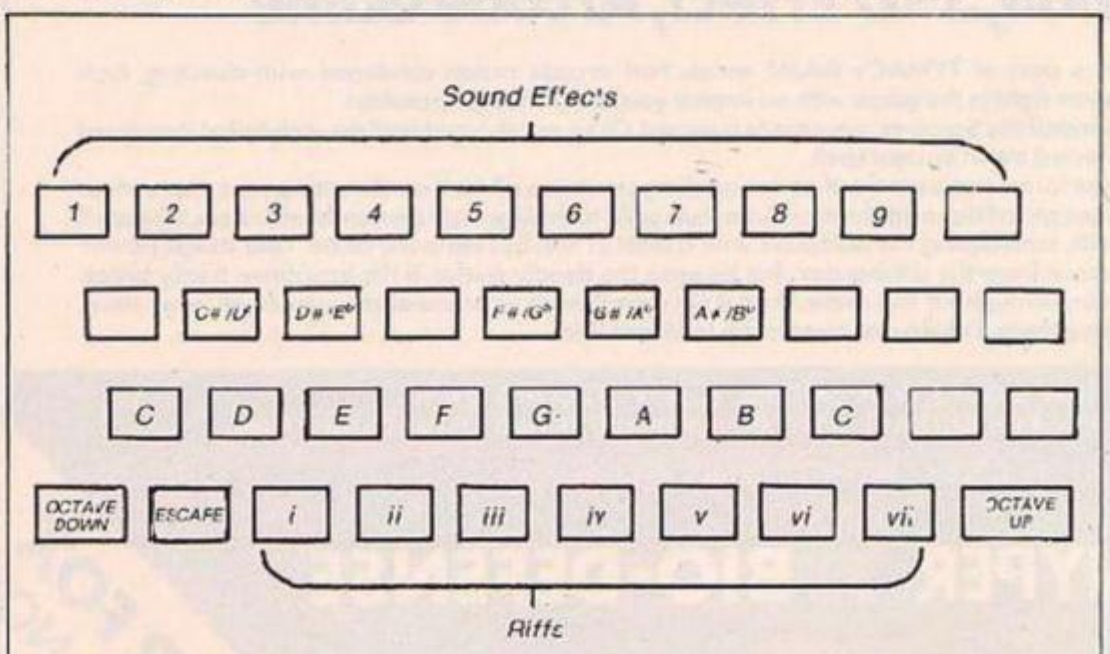


Figure 1.

Code 1.

```
31965: 21005005CD7E23D8  = 560
31973: FEA628042312F8C9  = 962
31981: 3E7ED8FEE6012811  = 950
31989: 3EFED8FEE6012810  = 1076
31997: 5E066C1C10FD4010  = 494
32005: 07580613C12FD043  = 489
32013: 05482AFEFF0510AF  = 625
32021: 5ED54EB92801C541  = 879
32029: 1C10FDC13E32B8DC  = 1009
32037: 4E7DC5CB23CB23E5  = 1059
32045: 211A8048C602D4AA  = 879
32053: 5E23562346234E66  = 537
32061: 61CDB503E1C1D123  = 1148
32069: 10CFC91E30C90000  = 703
32077: 0000021E48D060A   = 405
32085: 7E23DBFEF6230523  = 880
32093: 10F8181205CB2066  = 548
32101: 2600018830ED4A5E  = 820
32109: 2356ED53FEFF2170  = 1095
32117: 87060772E3DBFEA6  = 948
32125: 2604231DF6C905CB  = 750
32133: 20CB20CB20CB2048  = 809
32141: 0600217EE7ED4A06  = 617
32149: 103EFF8EC84EE5C5  = 1227
32157: CD0F7DC1E12310F1  = 1055
32165: 0000 = 001
```

Code 2.

```
32768: BF04BF03DF08BF10  = 832
32776: DF10FD10FB10FD08  = 1036
32784: FD04FB04FD02FB02  = 1020
32792: FD0101001F20C010  = 510
32800: 360C02006508020C  = 214
32808: DE0A02004A0A020C  = 310
32816: A80902001F09020C  = 224
32824: 9A0802001D08020C  = 203
32832: A607020036070300  = 239
32840: CE0C03000A05030C  = 300
32848: 0C06030084050300  = 209
32856: 6005030011050400  = 130
32864: C704040080040400  = 343
32872: 3E040400FF050500  = 300
32880: C403050080305000  = 352
32888: 5803050026030600  = 140
32896: F7020500CB020600  = 466
32904: H1020700/H020700  = 301
32912: 5402030031020800  = 153
32920: 10020900F1010900  = 278
32928: D3010A00B7010A00  = 416
32936: 9B010B0084010C00  = 314
32944: 6C010C0056010D00  = 221
32952: 41010E002E010F00  = 142
32960: 16010F000A011000  = 70
32968: F9001100E9001200  = 517
32976: DA0013000D001500  = 463
32984: BF0016003000000   = 396
32992: 00000000EF02EF04  = 484
33000: EF03EF10F710F708  = 1020
33008: F704F702F701EF01  = 988
33016: 40813031 = 370
```

Code 3.

```
34672: 7F027F047F087F10  = 538
34680: FE10FE08FE040102  = 793
34688: 0304 = 7
```

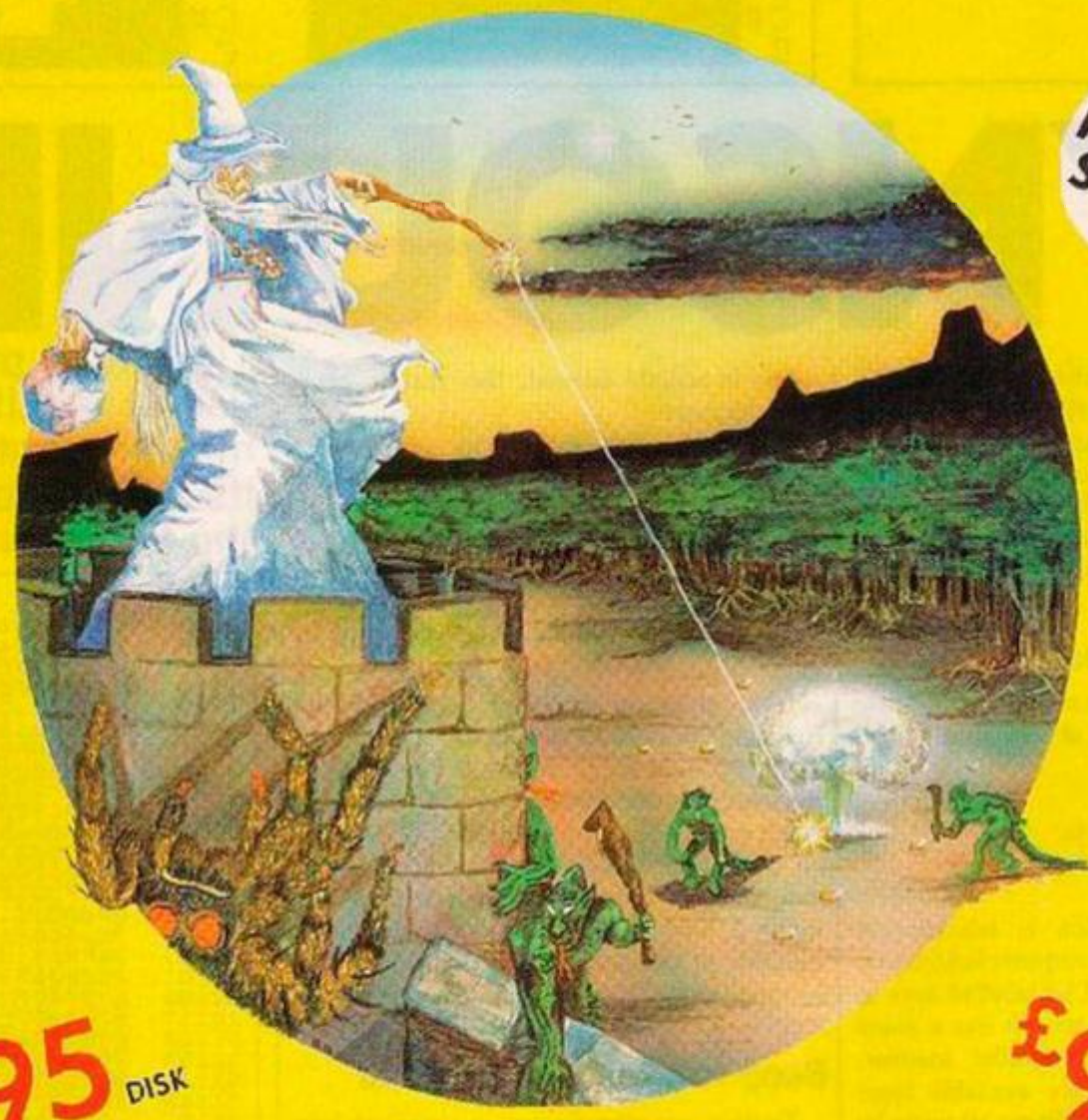
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Listing 1.

```
   5 LOAD ""CODE : LOAD ""CODE :
 POKE 65535,129: POKE 65534,48:
GO TO 100
   6 POKE 23658,8
 100 CLS : PRINT "++++SYNSOUNDS+
++++BY T.HOBS++++
                 ++++++++++++MA
IN MENU++++++++++++"
 110 PRINT : PRINT "(1) PLAY": P
RINT : PRINT "(2) ASSIGN FUNCTIO
N KEYS": PRINT : PRINT "(3) DEFI
NE SOUNDS": PRINT   PRINT "(4) D
EFINE PROGRAMS"
 120 IF INKEY$="1" THEN GO TO 20
0
 130 IF INKEY$="2" THEN GO TO 40
0
 140 IF INKEY$="3" THEN GO TO 60
0
 145 IF INKEY$="4" THEN GO TO 80
0
 150 GO TO 120
 200 CLS
 210 LET A=USR 31965: LET A=USR
32060: IF INKEY$="Z" THEN GO TO
100
 220 GO TO 210
 400 INPUT "FUNCTION KEY ? (1 TO
 10) ";K
 405 IF K=10 THEN LET K=0
 410 INPUT "SOUND NO. ? (0 TO 99
) ";E
 420 LET H=33072+(E*16)
 430 POKE 33016+(K*2)+1,INT (H/2
56): POKE 33016+(K*2),H-((INT (H
/256))*256)
 440 GO TO 100
 600 CLS : INPUT "SOUND NO. ? (0
 TO 99) ";N
 610 LET H=N*16+33072
 620 CLS
 625 FOR G=9 TO 21: READ S$: PRI
NT AT G,0;S$: NEXT G
 626 DATA "C","B","A#","A","G#",
"G","F#","F","E","D#","D","C#","
C"
 627 RESTORE
 628 PRINT AT 8,2;"0123456789ABC
DEF"
 630 FOR X=0 TO 15
 640 LET Y=21
 650 PRINT AT Y,X-2;"■"
 655 PAUSE 0
 660 IF INKEY$="6" AND Y<21 THEN
 PRINT AT Y,X+2;" ": LET Y=Y+1:
GO TO 650
 670 IF INKEY$="7" AND Y>3 THEN
LET Y=Y-1: GO TO 650
 680 IF INKEY$="0" THEN POKE H+X
,(21-Y)+12: GO TO 689
 685 GO TO 650
 689 NEXT X
 690 BEEP .5,10
 700 GO TO 100
 800 CLS : INPUT "PROGRAM NO. ?
(0 TO 6) ";P
 803 PRINT AT 4,0;" PROGRAM LENG
TH - 0 TO 15 NOTES"
 804 PRINT AT 7,0;"  LOW    MIDD
LE    HIGH"
 805 FOR G=9 TO 21: READ S$: PRI
NT AT G,0;S$;AT G,8;S$;AT G,16;S
$;AT G,4;(21-G);AT G,12,(21-G)+1
2;AT G,20;(21-G)+24;: NEXT G
 806 RESTORE
 807 PRINT AT 15,23;"INVERSE 1;"
TYPE 255";AT 16,23;"TO    END"
 810 LET H=P*15+34686
 820 FOR G=H TO H+15
 825 INPUT O: IF O<0 OR (O>36 AN
D O<>255) THEN BEEP .05,20: GO T
O 825
 826 IF O=255 THEN POKE G,0: GO
TO 100
 830 POKE G,0: NEXT G
 840 GO TO 100
```

(continued from page 95)

when it is reached. After levels in all 16 sectors have been defined in this way, a short beep returns you to the main menu.

Some examples of waveforms are depicted in figure 3, but you will obviously want to experiment with your own ideas.

Assign sound effects: From your bank of frequency waveforms produced in menu option 2 any 10 can be chosen for instant recall at the touch of a button. Simply type in a number from 1-10, followed by the number of the waveforms. When you now play the piano keyboard, each note will take on the "flavour" of the sound effect chosen. Pressing another of the keys 1-10 will change to a new sound effect without interrupting the flow of music.

Play sequence of notes

Compose riffs: It is often necessary to play a short riff — sequence of notes — which is repeated many times and may be complicated or fast. Synsounds allows up to seven riffs to be stored simultaneously and then replayed by pressing a single key. It is thus possible to give a creditable musical performance with a minimum of stamina and skill. On the computer keyboard in figure 1 the keys labelled (i) to (vii) in the bottom row refer to these pre-programmed riffs.

After entering the number of the riffs you wish to compose (0-6), the Spectrum will draw up a chart of all the notes playable — three octaves. Each note has a number 0-36 — 0 for the lowest C and 36 for the highest, and it is this number that you must enter to place the desired note in the memory. Up to 16 notes can be entered in a single program, but if less than this number are required then typing 255 will complete the riff and return you to the main menu.

Longer notes can be entered by repeating the note several times.

Listing 2.

```
   5 REM  spectrum hex loader
  10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
  20 INPUT "start ";s
  30 INPUT "finish ";f
  40 FOR n=s TO f STEP 8
  50 LET tot=0
  60 PRINT n;" ";
  70 INPUT h$: PRINT h$;
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET t=FN h(h$): LET tot=tot
+t
 100 POKE n+b,t
 110 LET h$=h$(3 TO )
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 160 REM Enter STOP to stop
```

Note that the riff will be played in the current waveform, so the 'flavour' of the riff can be altered by pressing any of the keys 1-10.

Sound produced only by the Spectrum's internal speaker will rarely be of sufficient volume, so amplification can be achieved by connecting the mic socket on the tape recorder to the mic socket on the Spectrum and push down the record button on the recorder.

Entering synsounds

To enter Synsounds, I advise the following method:

1. Enter the Basic program from listing 1. Save it by typing: SAVE "SYNSOUNDS" LINE 5.

2. NEW the program.

3. Type in the Basic program from listing 2. Type in Run.

4. Enter the code from listing 3-work from left to right and from up to down.

5. Save the code directly after the first Basic program by typing:
SAVE "CODE 1" CODE 31965,204: SAVE "CODE 2+3" CODE 32768,1922.

6. New the program.

7. Load the finished program by rewinding the tape and typing: LOAD "SYNSOUNDS".

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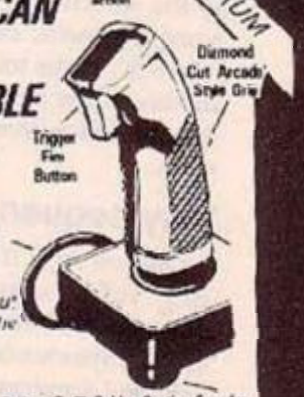
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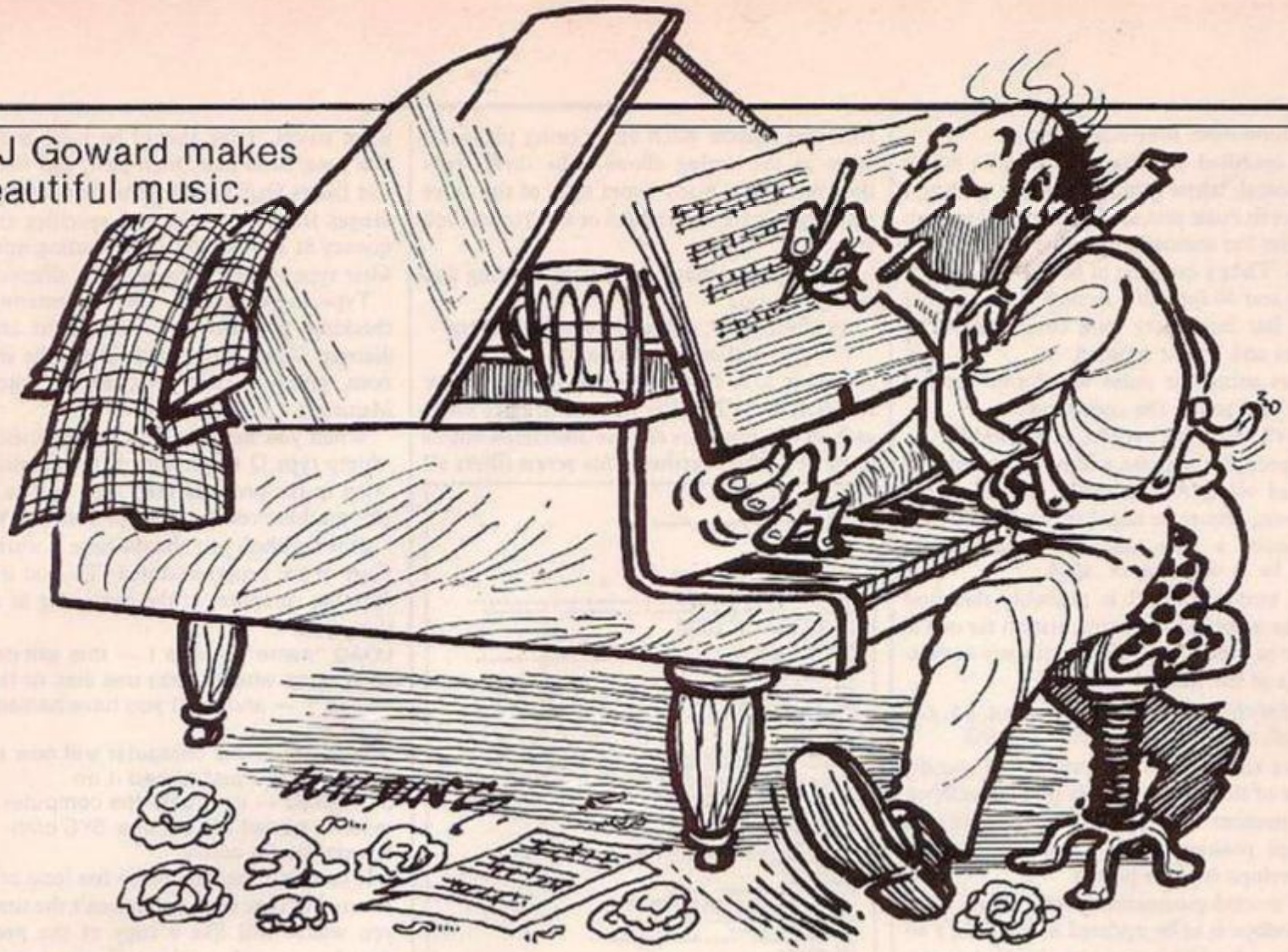
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If you are one of the many people that have parted with the £50 required for Simon's Basic then you will have no doubt been disappointed with the very poor sound commands which will only allow music to be played in one voice. However, for the rest of the Basic I have few complaints.

All sounds have one main command to activate them, to relieve complications that could otherwise arise, and also, since all sound generation is controlled by microprocessor interrupts, basic programs will still continue to be executed while the sound is played. Facilities are provided for harmonies to be played in all three voices, and each voice allows four notes to be buffered and subsequently played.

Thus a duration must be specified for each note eliminating the time delays required by some computers for their sound. The commands allow for all of the musical waveforms and modulations of the chip to be used as well as the programmable filter. The width of the pulse waves generated by each voice may also be programmed.

All of the commands are of the form of an extended SYS statement, here 380Z users will notice a similarity with RML's Call command. The routine works by redirecting every SYS statement just before it is encountered by the basic interpreter, and then, if it is of the form of an extended statement, it redirects the SYS call to the appropriate sub-routine.

A simple example is

```
SYS "VOLUME", 15
```

which sets the total output volume for all three voices, it's parameter should bein the range 0 . . 15 where 0 is silence and 15 is maximum volume, any value given that is greater than 15 or negative will be scaled into the correct range. After setting the volume, and before any notes may be played on a particular voice, a SYS "ADSR" must be made. This is of the form:

```
SYS "ADSR", voice, attack, decay, sustain, release
```

and determines the volume envelope for any note following on the specified voice.

Voice should be in the range 1 . . . 3, a larger value will be scaled into this range but a zero will give an error. Attack specifies the rate at which the sound reaches it's maximum volume, while decay governs the rate at which the note decreases in volume after its attack sequence sustain specifies the volume level at which the note is then maintained, and finally release governs the rate at which the note falls to zero volume after its duration has ended.

Thus

```
SYS "ADSR",1,0,9,0,0
```

will set for voice 1 the familiar harpsichord — type envelope, while

```
SYS "ADSR",1,0,0,15,0
```

will set for voice 1 an envelope which instantly reaches its maximum volume and when the note has finished it will instantly decay to zero volume. Each of the final 4 ADSR parameters should be in the range 0 . . .15.

Once a voice has had its ADSR envelope set any number of sounds may be played on that voice with the command:

```
SYS "SOUND", voice, wave, envelope, frequency, duration
```

Voice may take the values 1. .3, 5. .6, 9. .11, 13. .15. 1. .3 do, as you might expect, just play on that specified channel. Five and 6 work for voices 1 and 2 respectively, and allow synchronisation of two notes on these channels.

Thus after a channel of five has been specified this note will not be played until a command to channel 6 has been executed and then these two notes will be played together. Channels 9. . 11 have a similar function but synchronise three-note chords together on all three channels, 13. . 15, before they play the note specified, flush the sound buffer for their respective voices, 1, 2 and 3, and the note will be played disregarding any previous note on that channel. Wave sets the sound wave to be used: 0. .3 are triangle, sawtooth, pulse, and noise waveforms.

The envelope parameter may take the values 0. .3, 0 specifies a pure note while 1. .3 are reserved for the pitch envelopes — see "envelope" command. Pitch may be varied in the range 0. .55535 in increasing frequency.

(continued on next page)

(continued from previous page)

The specified duration should be in 60th's of a second, when using alternative interrupt routines to those provided by the machine this may alter but normally it will be in 60th's of a second. Thus a duration of 60 will last for one second and 40 for half a second. A duration of 0 will last for a very long time: approx 18 minutes and is best avoided.

Before using the pulse waveform, number 2, it is best to use the command:

SYS "WIDTH", voice, pulse width

This specifies the pulse width to be used by a specified voice. A width of 0, the default on switch-on, cannot be heard very well but 2500 gives quite a nice tone. The pulse width should be in the range 0 .4095.

The next command is probably the most complex and needs experimentation for one to be able to predict it's effects with any certainty. It is of the form:

SYS "ENVELOPE", number, timing, p1, p2, p3, stepsin1, stepsin2, stepsin3

Number should be in the range 1. .3 specifying one of the three available pitch envelopes. This number should also appear in the envelope position of the sound command if the envelope is to be played.

The second parameter specifies how often the envelope is to be updated in 60th's of a second from 0. .127 but if 128 is added to this number then the envelope will automatically repeat itself once the 3 steps have finished, otherwise it will complete the sound with the final pitch played. Then the next three values determine what is to be added or subtracted from the current pitch value being played as often as the timing allows. The three steps determine how many times each of the three pitch values are to be added or subtracted each step.

The final command deals with filtering and is of the form:

SYS"FILTER", voice(s), type, cutoff frequency, resonance

Numbers 1, 2, 4 each correspond to the three voices 1, 2, 3. To filter more than once voice each of the numbers for the associated voices must be added together, thus seven filters all three voices. Type should be 1,2,4 and 5 for low pass, band pass, high pass, and notch reject filters respectively. The cutoff frequency ranges from 0. .65535 and specifies the frequency at and around — depending upon the filter type — which the sound is filtered.

Type in program 2, the hex entering and checking program and save it to tape or discette. Then run it and follow the instructions given in the program to enter the Musicode 1.1 hex. dump.

When you have finished entering the hex. dump type Q to get out of the current section in the program then type in 2 to save the machine code on disc or cassette. When all is finished you should have a working copy of the program stored. To load it back into the computer at the beginning of a session type:

LOAD "name", device 1 — this will depend upon whether you use disc or tape — 8 or 1 — and what you have named the program.

SYS 58260 — the computer will now reset as if you have just turned it on

SYS 51680 — now until the computer is reset or turned off the new SYS commands will be active

If you find the hex dump too long or complicated to type in or you haven't the time and you would still like a copy of the program then I can supply copies on cassette complete with a program that will transfer the program to disc if you send a cheque or postal order to the value of £2.50 to the following address: Mr. Philip J. Goward, 28 Trueway Rd., Evington, Leicester LE5 5UG. ■

Program 1



Musicode 1.1 hexadump.

```
C000  A2 00 BD C0 32 C9 00 F0 ( 981 )
C008  00 26 20 C8 30 A9 02 C9 ( 845 )
C010  02 F0 03 20 1C CB E0 E0 ( 968 )
C018  03 D0 E7 4C 31 EA EA EA ( 1239 )
C020  60 1C 30 00 07 0C 15 EA ( 360 )
C028  00 AA A2 00 9D 29 DA A7 ( 1052 )
C030  C9 00 D0 03 20 45 C8 DE ( 935 )
C038  BA 02 BD BA 32 C9 FF D0 ( 1229 )
C040  03 DE 00 02 00 BD 23 C8 ( 938 )
C048  85 60 A9 D4 35 81 60 20 ( 1221 )
C050  06 16 65 54 52 50 A9 00 ( 918 )
C058  69 03 85 5C A2 01 81 30 ( 898 )
C060  29 FE A2 04 91 00 BD EA ( 1203 )
C068  02 30 29 0A 48 F0 07 85 ( 610 )
C070  C9 A0 00 85 EA AE 15 A4 ( 1052 )
C078  C9 01 90 A4 EA 91 90 E6 ( 1419 )
C080  C9 E6 EA CA 20 F1 60 AA ( 1550 )
C088  DE C8 02 D0 37 68 60 60 ( 943 )
C090  60 4C 16 C0 A0 00 81 90 ( 894 )
C098  C9 00 F0 26 25 AF C9 01 ( 1197 )
C0A0  B9 00 02 C6 AF CD A0 03 ( 954 )
C0A8  D0 02 C6 AF CD BC 03 D0 ( 1137 )
C0B0  02 C6 AF A5 AF C9 00 F0 ( 1156 )
C0B8  0C C9 FF F0 08 A0 FF 90 ( 1237 )
C0C0  EA 02 AE 03 B1 90 40 C8 ( 1003 )
C0C8  B1 90 AE 01 91 90 90 B7 ( 1154 )
C0D0  02 00 60 91 90 90 04 02 ( 902 )
C0D8  A0 05 B1 90 90 0A 02 C8 ( 1042 )
C0E0  B1 90 9C 00 02 A0 01 B1 ( 1010 )
C0E8  90 A0 04 91 90 A0 02 B1 ( 979 )
C0F0  90 90 A6 02 C9 00 D0 01 ( 892 )
C0F8  60 A0 A5 FF 90 AE 02 89 ( 1206 )
C100  C9 02 20 7F 90 A0 03 00 ( 688 )
C108  D0 02 9C B1 02 09 D0 02 ( 900 )
C110  90 ED 02 60 DE A0 02 00 ( 1078 )
C118  A0 02 3C 01 60 B0 01 02 ( 686 )
C120  D0 ED 02 D0 43 C9 00 D0 ( 1144 )
C128  3F FE AE 02 B0 AE 02 C9 ( 1059 )
C130  03 D0 12 BD A0 02 A0 00 ( 892 )
C138  B9 C8 02 30 06 A9 02 90 ( 762 )
C140  A0 02 60 A9 00 90 AE 02 ( 768 )
C148  0A E5 9E 0A 10 E5 9E 70 ( 719 )
C150  A0 02 E5 D7 E5 90 A9 02 ( 949 )
C158  85 5C AE 00 B1 90 9C B1 ( 1115 )
C160  02 A0 03 B1 90 90 E0 02 ( 890 )
C168  BD AE 02 0A E5 00 0A 10 ( 697 )
C170  E3 30 70 F0 0E 0F E3 E5 ( 906 )
C178  90 A9 02 E5 3C A0 00 B1 ( 992 )
C180  98 10 70 04 22 90 04 02 ( 825 )
C188  A0 03 B1 98 70 B7 02 90 ( 962 )
C190  07 AF 00 23 C9 E5 00 A9 ( 1097 )
C198  D4 85 B1 8D 04 02 A0 00 ( 1053 )
C1A0  B1 00 00 07 02 C8 91 00 ( 1216 )
C1A8  DE B1 02 8D B1 02 C9 FF ( 1225 )
C1B0  D8 03 DE E0 02 8D A0 02 ( 1031 )
C1B8  F0 00 00 E3 02 E9 7F 90 ( 1011 )
C1C0  A8 02 60 FF FF FF 03 FF ( 1258 )
C1C8  FF FF FF FF FF FF FF FF ( 2048 )
C1D0  FF FF FF FF FF FF FF FF ( 2048 )
C1D8  FF FF FF FF FF FF FF FF ( 2048 )
C1E0  A9 20 85 73 A9 EA 85 74 ( 887 )
C1E8  A9 CA 85 75 A9 EA 85 76 ( 1275 )
C1F0  85 77 85 78 60 00 00 00 ( 601 )
C1F8  00 00 00 00 00 00 EA EA ( 400 )
1A00  E6 7A D0 02 E6 7B EA EA ( 1383 )
1A08  A4 02 A0 00 B1 7A C8 AE ( 936 )
1A10  F0 06 A4 02 60 EA EA EA ( 1210 )
1A18  06 BE A2 01 A9 00 85 FF ( 1042 )
1A20  B1 7A C9 20 D0 03 C8 D0 ( 1151 )
1A28  F7 C9 22 F0 03 4C 12 CA ( 1021 )
1A30  A2 00 E8 B1 7A C9 22 F0 ( 1136 )
1A38  09 90 E8 83 E4 FF E8 E0 ( 1246 )
1A40  08 D0 EF 4C 25 AF C8 90 ( 1065 )
1A48  18 65 7A 85 7A A9 00 65 ( 772 )
1A50  7B 85 7B A9 00 85 FD A9 ( 1107 )
1A58  C8 85 FE A2 20 81 FD C9 ( 1301 )
1A60  00 D0 03 4C B2 CA C5 FF ( 1115 )
1A68  F0 0F A0 01 B. FD AA C8 ( 1216 )
1A70  B1 FD 85 FE 86 FD 4C 38 ( 1371 )
1A78  CA A0 00 A2 00 B1 FD 90 ( 1106 )
1A80  E9 03 D0 E6 E9 C8 E4 FF ( 1508 )
1A88  D8 F3 20 93 CA 10 A0 BE ( 1212 )
1A90  4C 12 CA A0 03 B1 FD 85 ( 1002 )
1A98  FB C8 B1 FD 85 FC 6C F8 ( 1625 )
1AA0  60 00 3F 4E 41 4D 45 20 ( 397 )
1AA8  4E 4F 54 20 46 4F 55 4E ( 585 )
1AB0  44 FF A2 00 BD A1 CA 20 ( 1869 )
1AB8  D2 FF E8 E0 10 D0 F5 4C ( 1466 )
1AC0  85 A4 EA EA EA EA EA EA ( 1669 )
1AC8  20 FD AE 20 BD A0 A5 E6 ( 1061 )
1AD0  85 FF A9 00 85 00 20 F7 ( 187 )
1AD8  B7 AE 14 A4 15 A5 FF 20 ( 1022 )
1AE0  2C EA EA EA EA EA EA EA ( 1852 )
1AE8  EA EA EA 18 60 38 A9 50 ( 951 )
1AF0  E5 14 85 32 AA A5 00 E5 ( 1094 )
1AF8  15 AB 38 60 EA 58 4A 47 ( 800 )
1B00  06 00 CB A0 CC 56 4F 4C ( 665 )
1B08  55 4D 45 34 17 C9 10 CC ( 699 )
1B10  41 44 53 52 00 21 CB 55 ( 627 )
1B18  CC 45 4E 56 45 4C 4F 50 ( 741 )
CE20  45 05 20 C8 B9 CC 57 49 ( 889 )
CE28  44 54 49 00 96 CB DA 00 ( 699 )
CE30  46 49 4C 54 45 52 00 40 ( 583 )
CE38  CB 17 CD 53 4F 55 4E 44 ( 824 )
CE40  00 FF FF FF FF FF FF 3F ( 1109 )
CE48  FF FF FF FF FF FF FF FF ( 2340 )
CE50  FF FF FF FF FF FF FF FF ( 2340 )
CE58  FF FF FF FF FF FF FF FF ( 2340 )
CE60  00 00 00 00 00 00 00 00 ( 0 )
CE68  00 00 00 00 00 00 07 00 ( 131 )
CE70  00 00 00 00 00 00 19 00 ( 25 )
CE78  00 00 00 00 00 00 FF 00 ( 255 )
CE80  53 FF FF FF FF FF FF 01 ( 1742 )
CE88  FF FF FF FF FF D7 FF FF ( 2340 )
CE90  FF FF FF FF FF F7 FF FF ( 2332 )
CE98  FF FF FF FF FF FF FF FF ( 2340 )
CEA0  00 00 00 00 00 00 00 00 ( 133 )
CEA8  00 00 00 00 00 00 00 00 ( 255 )
CEB0  00 00 00 00 00 00 00 00 ( 255 )
CEB8  00 00 FF 00 00 00 00 00 ( 255 )
CEC0  FD FF FF FF FF FF FF 03 ( 1314 )
CEC8  FF FF FF FF FF FF FF FF ( 2340 )
CED0  FF FF FF FF FF FF FF FF ( 2340 )
CED8  1E 96 18 0E 00 96 7C 9F ( 894 )
CEE0  EA A0 00 99 AC 00 F0 00 ( 1187 )
CEE8  E6 D4 0F E1 F0 EC 2C F0 ( 1595 )
CEF0  11 21 41 81 13 23 43 83 ( 486 )
CEF8  15 25 45 85 19 29 49 89 ( 536 )
CF00  20 C8 DA 9A 28 0F AA AD ( 971 )
CF08  A5 A0 00 99 AC 00 F0 00 ( 1187 )
CF10  18 6D A2 02 8D A7 02 8D ( 753 )
CF18  18 D4 60 20 C8 CA 8A 29 ( 915 )
CF20  83 E9 00 D0 01 60 AA 00 ( 858 )
CF28  22 C8 65 FB A9 D4 85 FC ( 1304 )
CF30  28 3F CC A0 06 85 FB 20 ( 882 )
CF38  3F CC A0 06 91 FB 60 20 ( 857 )
CF40  C8 CA 8A 29 0F 8A 8A 8A ( 626 )
CF48  0A 85 FE 20 C8 CA 8A 29 ( 1310 )
CF50  0F 18 69 FE 60 20 C8 CA ( 824 )
CF58  28 83 C0 01 60 EA EA EA ( 1351 )
CF60  EA 18 69 C2 85 FB A0 02 ( 1112 )
CF68  85 FC 20 C8 CA 8A A2 00 ( 1117 )
CF70  91 FB A9 03 85 FD E6 FB ( 1435 )
CF78  E6 FB E6 FB 20 C8 CA 98 ( 1540 )
CF80  48 A2 00 8A 91 FB A0 03 ( 919 )
CF88  69 91 FB E6 FB E6 FB E6 ( 1582 )
CF90  FB C6 FD D0 E1 E6 FB E6 ( 1346 )
CF98  F0 E6 F0 D0 60 CA A9 00 ( 1020 )
CFA0  A5 14 91 FB A5 15 A0 03 ( 930 )
CFA8  91 FB E6 FB E6 FB E6 FB ( 1339 )
CCB0  26 F0 A5 FD 29 F0 D0 DD ( 1752 )
CCB8  30 26 C9 0A 20 03 D0 01 ( 709 )
CCC0  30 A8 B0 22 38 05 FB 69 ( 1242 )
CCC8  04 85 FC 20 C8 CA 98 29 ( 1224 )
CCD0  3F A0 03 91 FB 0A 00 01 ( 903 )
CCD8  F8 60 20 C8 CA 8A 29 0F ( 975 )
CCE0  35 FE A0 A7 32 29 0F 00 ( 826 )
CCE8  A7 02 20 C8 CA 29 07 0A ( 66 )
CCF0  3A 0A 0A 10 3D A7 02 0D ( 473 )
CCF8  A7 02 0D 10 34 20 C8 CA ( 980 )
CD00  8E 15 D4 0C 16 D4 20 C8 ( 98 )
CD08  CA 0A 29 0F 0A 0A 0A 0A ( 436 )
CD10  10 65 FE 0D 17 D4 60 AD ( 1024 )
CD18  15 02 C9 EA 00 17 70 A9 ( 575 )
CD20  30 09 14 03 A9 C8 8D 15 ( 695 )
CD28  03 A9 00 0D C8 02 60 C1 ( 84 )
CD30  32 08 C2 02 38 20 C8 CA ( 86 )
CD38  85 FE 29 0C 4A 4A 0D F8 ( 969 )
CD40  32 A8 A5 FE 29 03 D0 01 ( 842 )
CD48  38 05 FE C6 FE 88 C8 03 ( 1291 )
CD50  30 2C A6 FE CA EA EA EA ( 1010 )
CD58  EA EA EA 8D 20 C8 10 69 ( 1252 )
CD60  34 85 F8 A9 30 69 03 85 ( 926 )
CD68  FC A6 20 98 31 F8 C8 C8 ( 1352 )
CD70  C8 C8 C8 A9 30 20 C8 A8 ( 1045 )
CD78  3D 84 02 90 30 02 EA EA ( 1161 )
CD80  A0 F8 02 C9 88 F0 03 EE ( 1697 )
CD88  F8 02 A0 F8 02 C9 04 D0 ( 1070 )
CD90  55 A9 00 8D F8 02 20 C8 ( 703 )
CD98  CA 29 0F 8D F8 C8 8D F1 ( 1272 )
CDA0  32 20 C8 CA 29 03 8D F2 ( 883 )
CDA8  32 20 C8 CA 3E F3 02 8C ( 961 )
CDB0  74 02 90 4C 26 14 A9 00 ( 853 )
CDB8  35 F8 38 A5 14 38 E9 8C ( 928 )
CDC0  90 07 85 14 C6 F9 4C B8 ( 1050 )
CDC8  CD A9 00 38 E5 F9 85 FD ( 1306 )
CDD0  A5 14 6A AA 3D D8 CB 85 ( 1106 )
CDD8  FB E9 BD D8 CB 85 FC A5 ( 1641 )
CDE0  FD C9 66 F0 11 A9 14 18 ( 929 )
CDE8  CA EA EA EA CA 66 FC 66 ( 1026 )
CDF0  FB 18 C6 FD 30 F7 A5 FB ( 1597 )
CDF8  3D F3 02 A5 FC 80 F4 82 ( 1198 )
CE00  20 C8 CA BE 75 02 8C F6 ( 1209 )
CE08  32 A6 FE 8D 30 02 C9 04 ( 1018 )
CE10  F0 F5 20 C9 30 08 02 A9 ( 1189 )
CE18  31 10 85 FD 38 01 8D C6 ( 886 )
CE20  32 80 20 C8 A6 F8 18 7D ( 991 )
CE28  39 C8 68 04 3E F9 A0 02 ( 1020 )
CE30  35 FC A8 00 39 F8 02 51 ( 1117 )
CE38  F8 C8 C0 07 30 F6 50 60 ( 1280 )
```

Program 2. Example.

```
10 REM FRERE JACQUES
20 DIM F(2,40),L(2,40),T(2),P(2)
30 GOSUB700
40 V=0:I=0:GOSUB1000
50 V=1:I=1:GOSUB1000:F(J,0)=0:L(V,0)=16
60 V=2:I=1:GOSUB1000:F(J,0)=0:L(V,0)=32
70 GOSUB500
80 END
90 :
500 FOR I=1TO3:SYS"RESR",1,6,9,0,0
510 P(I-1)=0:NEXT
520 SYS"VOLUME",15
530 FOR I=1TO3:SYS"SOUND",I+12,0,0,0,1
540 SYS"SOUND",I+8,0,0,0,20:NEXT
550 F=0:FOR I=0TO2
560 IFP(I)>T(I)THENP=P+1:GOTO600
570 IFPEEK(784+I)=4THEN600
580 SYS"SOUND",I+1,0,0,F(I),P(I)),L(I,P(I))+0
590 F(I)=P(I)+1
600 NEXT:IFF<3THEN550
610 RETURN
620 :
700 FORV=0TO2:FORI=0TO40
710 L(V,I)=4:NEXTI,V
720 RETURN
730 :
1000 REM READ IN NOTES
1010 RESTORE
1020 FORJ=1TOI+31:READ F(V,J)
1030 F(V,J)=-F(V,J)-60:NEXT
1040 FORJ=1TOI:READ L(V,J)
1050 NEXT:T(V)=I+31:RETURN
1060 :
1100 DATA1,3,5,1,1,2,5,1,5,6,8,5,6,8
1110 DATA3,1C,0,5,5,1,0,10,0,0,5,1
1120 DATA1,-4,1,1,-4,1
1130 :
1140 DATA2,2,2,2,2,2,2,2,2,2,4,2,2,4
1150 DATA1,1,1,1,2,2,1,1,1,1,2,2
1160 DATA2,2,4,2,2,2
READY.
```



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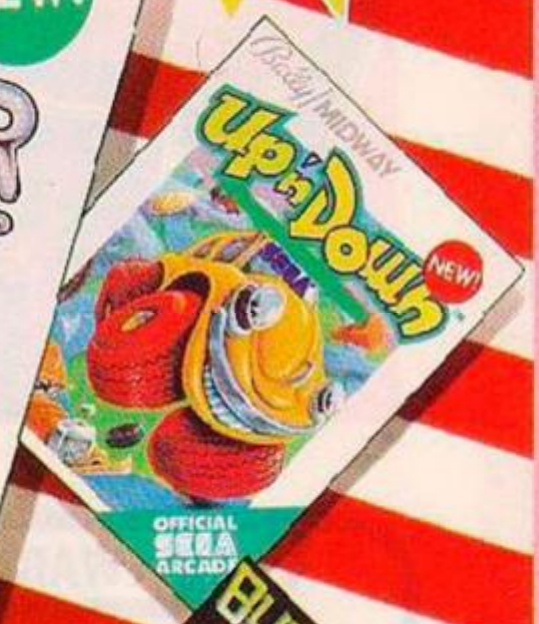
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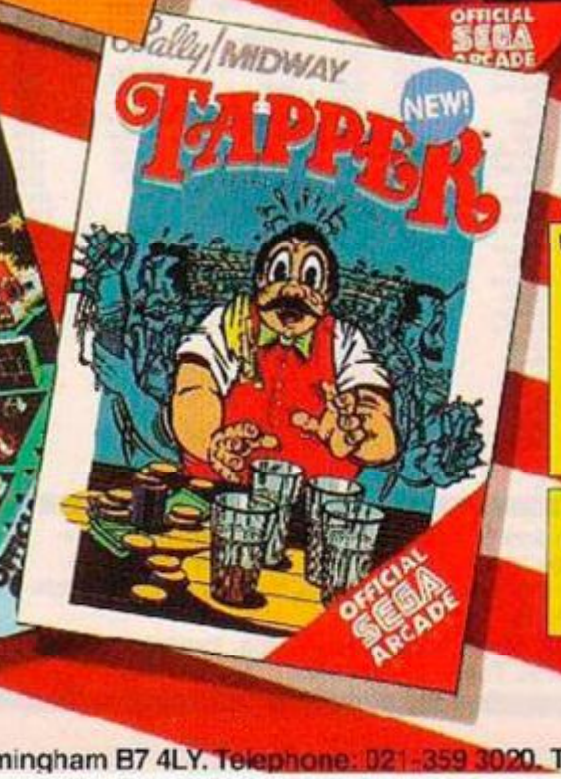












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TAPE TO MICRODRIVE

Colin Carruthers' easy conversion program

THE INTRODUCTION of the Sinclair ZX Microdrive system offers many users fast access to programs and data. Programs which once took several minutes to load can now be available in a matter of seconds. In fact, anyone who has used a Microdrive may be discouraged from using cassette-based software.

However, there are very few commercial programs available for the Microdrive due to the difficulty in duplicating large numbers of cartridges. Few software houses seem prepared to release details on how to convert their own programs for use on Microdrive for fear of escalating the piracy problem.

This is a weak argument since anyone with two cassette recorders and a blank tape can copy any program they wish. Several houses do release details, particularly publishers of serious software such as Tasman (Tasword), Campbell (Masterfile) and Hisoft with its series of compilers and assemblers.

Why should loading material from tape and saving on Microdrive cartridge present a problem? To answer that, we need to consider certain aspects of the operation of a Microdrive. If you examine the diagram in Chapter 24 of the standard Spectrum manual showing Ram allocation, you will see that there are two areas labelled "Microdrive Maps" and "Channel Information".

Whenever any Microdrive operation is invoked, these two areas grow by 32 and 595 bytes respectively. The Map holds information about the distribution of the 512 byte long blocks on the cartridge, while the Channel contains a 512 byte buffer along with details such as file name and type — see Microdrive and Interface 1 manual, Appendix 3.

In operation, consecutive blocks are passed via the buffer from the cartridge to memory or *vice versa* — depending on whether we are loading or saving. The main point is that the Basic program and variables must be moved up by 627 — ie, 32 + 595 — bytes. To make matters worse, Interface 1 appends 58 new bytes to the existing System Variables area. Thus, the Basic program resides at an address which is some 685 bytes higher up in memory when using the Microdrive.

So, why does this present us with a problem? Well, blocks of machine code which once loaded into the free space just above the Basic area might now overwrite part of the Basic program or, worse still, part of the Microdrive Map or Channel. Either way, the system is likely to crash with the Microdrive running, leaving us no option but to unplug the Spectrum and risk corrupting the material stored on the cartridge.

Programs can be divided into three categories. Those which are easy to convert to Microdrive — by the virtue of the addresses used, those which can be loaded into a higher memory address and copied down to their proper target address before being executed, and those which need to be divided into two smaller blocks and moved around after loading.

The first category includes programs written entirely in Basic — simply break into them and save auto-start on cartridge — and programs that have machine-code blocks which start at high addresses. Any block which starts above 25000 would normally fall into this category, but this does depend on the size of the Basic loader program. Program 1 gives lots of useful information about material stored on tape such as auto-start line number for Basic programs along with length and start address of machine-code blocks.

To use, simply run it and play back the relevant tape at normal load volume and tone settings. For each block in the program you wish to convert, note down all the details or dump the screen onto a printer.

Typical output from program 1 might look like:

```
Name   : Superzap
Type   : Basic
Start  : 10
Length : 132 bytes

Name   : Screen
Type   : Bytes
Start  : 16384
Length : 6912 bytes

Name   : Superzap
Type   : Bytes
Start  : 32768
Length : 32768
```

This is a fairly standard format, ie, Basic loader, title screen and main code block. Type New and Merge in the Basic loader. It might look something like this:

```
10 CLEAR 32767
20 LOAD "" CODE: LOAD "" CODE
30 PRINT USR 35000
```

It is probably best to forget the title screen. They are designed mainly to keep people amused while the main code loads. Besides, space on a cartridge is relatively expensive. Edit the program to make it load the main code from Microdrive thus:

```
10 CLEAR 32767
20 LOAD *"m";1;"Superzap c" CODE
30 PRINT USR 35000
```

Note that we have had to change the name of the code block since we cannot have two files with the same name on the cartridge. Save this on Microdrive to auto-run from line 10. Now do:

```
CLEAR 32767 : LOAD "" CODE
```

to load in the main code from tape. Save this to cartridge by typing in, for example:

```
SAVE *"m";1;"Superzap.c" CODE
32768,32768
```

Reset the system by typing Print USR 0 and try loading in the program from Microdrive. Should there be any problems, check carefully that all addresses were typed in correctly.

We need to adopt a different strategy for programs with machine-code blocks which start below about 25000. For example, imagine a situation where the main block was 900 bytes starting at address 24000. Clearly, this would overwrite the Microdrive Channel and Basic program if we were to load it in from Microdrive to this address.

The solution is to load the code into a high address and use program 2 to generate a machine-code routine to copy it down to the correct place in memory. Program 2 does this by using the powerful — not to mention fast — LDIR instruction. To continue the above example, we would start by loading in the code from tape to — for example — 30000. Run Program 2 and enter the following values:

```
Block Start       : 30000
Block Length      : 900
New Address       : 24000
Execute Address   : 24000
```

The execute address can be found by examining the Basic loader for that program. Program 2 places a 14 byte copy routine at "start + length", 39000 in this case. Save this

(continued on page 105)

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sinclair

(continued from page 103)

to cartridge with something like

SAVE *"m";1;"File Name" CODE 30000,9014.

Note that the length has been extended by 14 to save both the code and the copy routine. Change the Basic loader to load in the machine-code from Microdrive, and the execute address — Print USR nnnnn — to be the start of the copy routine. Save this auto-run on Microdrive, reset the system and try it out.

But what about machine-code blocks which are too large to re-locate using the above technique? For example, say we had a block which was 41535 bytes long starting from location 24000. This block fills the memory from the top right down to address 24000, and does not leave space for any Microdrive operations.

What we need to do here is split the block into two, load the high address part into its proper location, load the low address part into the display file and then use the copy routine provided by program 2 to move the low block up to its correct address after all Microdrive operations are over. To continue the above example, first type:

CLEAR 23999 : LOAD " " CODE

Copy the bottom 1000 bytes into the display file using a short program such as:

```
10 For x=0 TO 999
20 POKE 16386+x, PEEK (24000+x)
30 NEXT x
```

and save this block to a temporary file on tape with

SAVE "temp" CODE 16386,1000

Now do a Clear 24999 to make space for the Microdrive system and save the top part to Microdrive cartridge with

SAVE *"m";1;"High" CODE 25000,40535

Reset the system, load in program 2 and then the temp code file from tape back into the display file. Start program 2 — by typing Go to 10, not Run which would clear the display file — and enter the following values:

Block Start	: 16386
Block Length	: 1000
New Address	: 24000
Execute Address	: 24000

Save this to Microdrive using

SAVE *"m";1;"Low" CODE 16386,1014

noting once again that the length must be increased by 14 to include the copy routine.

Finally, alter the Basic loader so that it loads in "High" and "Low" from Microdrive before doing a

PRINT USR 17386

Save this on the same cartridge, reset the system and take a deep breath before trying it out.

One word of warning. In all cases, think carefully where the stack is — if this is overwritten by anything a system crash is certain. The position of the stack is controlled by the Clear statement so many problems like this can be avoided.

With the help of the ideas presented in this article, it is possible to convert most programs to load from Microdrive. The time spent waiting for programs to load becomes negligible which means that the Spectrum owner can spend more time playing games and less time sitting around with nothing to do.

It is probably a good idea to have a menu program on each cartridge called "run" which lists the programs available. Program 3 gives an example of the one I use, and reduces program loading to three key presses — Run, Enter and n where n is the selected program.

Program 1.

```
 1 REM ************************
 2 REM *                      *
 3 REM * Program 1            *
 4 REM *                      *
 5 REM *   Header             *
 6 REM *                      *
 7 REM * Colin Carruthers     *
 8 REM *                      *
 9 REM ************************
10 DATA 55
15 DATA 62,0
20 DATA 221,33,0,0
25 DATA 17,17,0
30 DATA 205,86,5
35 DATA 1,1,0
40 DATA 216
45 DATA 11
50 DATA 201
55 BORDER 0: PAPER 0: INK 7: C
LS : PRINT "Header Version 2.0"
60 RESTORE : FOR x=USR "1" TO
USR "n"+2: READ a: POKE x,a: NEX
T x
70 POKE USR "1"+5,PEEK 23675:
POKE USR "1"+6,PEEK 23676
80 DIM t$(4,5): FOR x=1 TO 4:
READ t$(x): NEXT x
90 DATA "Basic","Data","Data",
"Bytes"
110 LET l=USR USR "1"
115 IF PEEK USR "b"=0 THEN GO T
O 110
117 IF l=0 THEN PRINT : PRINT "
Tape Loading Error": GO TO 150
120 PRINT : PRINT "Name  :";: F
OR x=USR "a"+1 TO USR "b"+2: PRI
NT CHR$ PEEK x;: NEXT x: PRINT :
PRINT "Type  :";t$(PEEK USR "a"
+1)
125 LET b=USR "b"
130 PRINT "Start :";PEEK (b+5)+
256*PEEK (b+6)
140 PRINT "Length:";PEEK (b+3)+
256*PEEK (b+4);" bytes"
150 POKE 23692,255: POKE USR "b
",0: GO TO 110
```

Program 2.

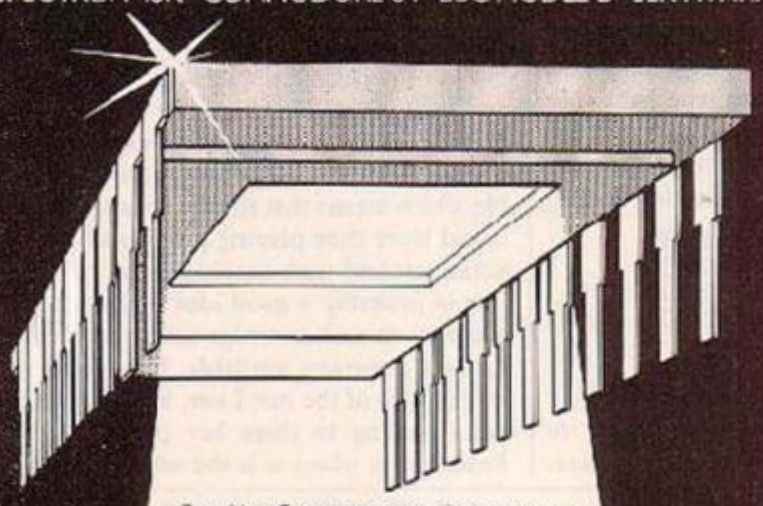
```
 1 REM ************************
 2 REM *                      *
 3 REM * Program 2            *
 4 REM *                      *
 5 REM * - Block Copy         *
 6 REM *                      *
 7 REM * Colin Carruthers     *
 8 REM *                      *
 9 REM ************************
10 DEF FN l(x)=x-256*INT (x/25
6)
20 DEF FN h(x)=INT (x/256)
30 INPUT "Block Start    :";st
art
40 INPUT "Block Length   :";le
ngth
50 INPUT "New Address    :";de
st
60 INPUT "Execute Address:";ex
100 LET code=start+length
110 LET x=0
120 READ v
125 IF v=999 THEN STOP
130 POKE code+x,v
140 LET x=x+1
150 GO TO 120
200 DATA 33,FN l(start),FN h(st
art),1,FN l(length),FN h(length)
,17,FN l(dest),FN h(dest),237,17
6,195,FN l(ex),FN h(ex)
210 DATA 999
```

Program 3.

```
 1 REM ************************
 2 REM *                      *
 3 REM * Program 3            *
 4 REM *                      *
 5 REM * - Typical run File   *
 6 REM *                      *
 7 REM * Colin Carruthers     *
 8 REM *                      *
 9 REM ************************
10 BORDER 0: PAPER 0: INK 7: C
LS
20 PRINT CHR$ (16);CHR$ (6);"C
C: Vol 07   22-Mar-84"
30 PRINT : PRINT
40 PRINT "1 - Fighter Pilot"
50 PRINT "2 - Manic Miner"
60 PRINT "3 - Jet Set Willy"
480 PRINT
490 PRINT CHR$ (16);CHR$ (6);"0
- Quit"
500 IF INKEY$="1" THEN CLS : PR
INT AT 10,9;"Fighter Pilot": LOA
D *"m";1;"Fighter.c"CODE 30000:
RANDOMIZE USR 63792
510 IF INKEY$="2" THEN CLEAR 30
000: PRINT AT 10,10;"Manic Miner
": LOAD *"m";1;"Manic.c"CODE : P
RINT USR 33792
520 IF INKEY$="3" THEN CLEAR 30
000: LOAD *"m";1;"Jetset.c"CODE
: CLEAR 25000: PRINT USR 33792
980 IF INKEY$="0" THEN GO TO 10
000
990 GO TO 500
```

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Access

NEWS-MONGER

Hear the latest from Franf Zym and his ZX-81.



NEWSMONGER IS a menu-driven program for the ZX-81 16K to show a text in giant letters. The menu has nine options:

- Character size 8 by 8.
- Character size 16 by 16.
- Character size 16 by 24.
- User-defined graphics.
- Fill character.
- Speed.
- Input text.
- Top line number.
- Save.

The almost entirely Basic program uses a machine-code routine held in line 0. The machine code is only 376 bytes long. The text may contain unshifted characters, inverse — shifted — function — and graphics.

The function characters plus the shifted character H represent the lower case characters. The shifted characters A, S, D, F, G, W, E, R, T, Y, 2, 3 and 4 are reserved for user defined graphics — UDGs. You can define eg., the character "!" and its inverse, which do not belong to the standard character set. When you don't like the lower case character set, you are also able to alter this.

In total you have 26 + 13 UDG's. You can't alter the "shifted" character Q because this character is used in string input. When you are not familiar with UDG's, read the article in *Your Computer* April 1984.

The data of the standard ZX-81 character set begin in the Rom at address $1E00 (7680 dec.) and end at address $1FFF (8191 dec.) Only the data of the characters with code 0-53 are in the Rom.

The data of the UDGs begin at address 16760; it starts with the data of the "shifted" character Q — code 192. Then the data of the "function" characters with code 193-215, followed by the "shifted" characters with code 216-229. The data of the "function" characters M, B and T with code 64-66 are placed after the "shifted" characters.

You have the option to alter the fill character of the giant letter, the speed and the top line number. The fill character can be a "unshifted" character, a inverse — or a graphic. Address 16690 holds the code.

```
PEEK(16751)-2-1
```

gives you the speed on a scale 0-9; 0 is fast, 9 is slow. 5 is the most "readable" speed. The top line number can vary for option 1 from 1-17, for option 2 from 1-9 and for option 3 the top line number will be 1. The program checks for invalid values.

There are different ways to save text. First you can run the program and enter your text in option 7:

```
"TEXT" N/L Z$
```

holds your text. Returning to option 7 and typing new text the old text is rubbed out. To prevent the loss of the old string variable Z$, you have to break out during input mode by

(continued on next page)

Hexdump.

```
16514: 0000000000000000 = 0
16522: 3F0D218A40221540 = 431
16530: CD1C11234E234523 = 503
16538: C5E5CDBB022CE1C1 = 1282
16546: C0C5E57EFE40280A = 1112
16554: FE412806FE422802 = 727
16562: 180306A680322140 = 474
16570: CBBF060816005F21 = 558
16578: 00001910FD3A2140 = 449
16586: FEC0380511783F18 = 731
16594: 0311001E19CDEA40 = 578
16602: E123C10D20BA78FE = 1058
16610: 0028A7C50E0018B0 = 426
16618: E5118240D5010800 = 662
16626: EDB03A2140CB7F28 = 938
16634: 0FCB77200B118240 = 591
16642: 06081A2F121310FA = 390
16650: 0E0806080C506012A = 282
16658: 0C40112200ED5211 = 463
16666: 21001910FAC1227B = 674
16674: 401121001 9D11ACB = 577
16682: 7F171213D528033E = 505
16690: 807710EDD1C50601 = 913
16698: C52A3440CB4520F9 = 908
16706: CD5641CD6D41C110 = 944
16714: EFC10D118240D520 = 901
16722: B9D1E1C92A7B4023 = 1084
16730: 233E08545D23011F = 349
16738: 00EDB02870023233D = 699
16746: C818F021A00C2B7C = 836
16754: B520FBC905050024 = 711
16762: 2400000000000000 = 36
16770: 3E4040403E000000 = 316
16778: 7C42427C40400505 = 518
16786: 0505050505050008 = 38
16794: 0008080808000004 = 36
16802: 0004040404380020 = 104
16810: 2438242222000000 = 196
16818: 3E42423E02020000 = 260
16826: 4949494936000000 = 346
16834: 3C427C403C000000 = 374
16842: 3C023E423E000000 = 252
16850: 3C403C023C000002 = 248
16858: 023E42423E000000 = 258
16866: 3E0408103E000000 = 152
16874: 2214081422000000 = 116
16882: 3E20202020000040 = 254
16890: 407C4242420000E = 400
16898: 107C101010000000 = 188
16906: 3E42423E023C0000 = 318
16914: 3C4242423C000020 = 350
16922: 2020202013000000 = 156
16930: 2222120C04180000 = 126
16938: 222222221E000000 = 158
16946: 3C2222222C000000 = 196
16954: 2222221403008000 = 258
16962: 00000000000000E0 = 224
16970: E00000000000F0F0 = 704
16978: F07E7E7E7E000505 = 754
16986: 0505050505050505 = 40
16994: 0505050505050000 = 30
17002: 0000000000E00000 = 224
17010: 0505050505050505 = 40
17018: 0505050505050010 = 46
17026: 1010100010000505 = 74
17034: 0505050505050024 = 66
17042: 0024242404380505 = 178
17050: 0505050505050505 = 40
17058: 0505050505050010 = 46
17066: 7C1010100E000040 = 250
17074: 407C42427C000000 = 444
17082: 7549494949000505 = 420
```

(continued from previous page)

rubbing out the first quote and then press "shifted" A N/L. Then you type:

LET A$ = Z$ N/L

and the old text is saved in the variables area. You return to the Basic program by typing:

GOTO 0 N/L

Do not use the command Run because this command will also clear the variables area, and that is what you don't want!

Second, you can break out during input mode to enter different string variables. You can use the string variables A$-X$ and subscripted string variables with no limitations.

You can rub out the quotes

Do not use Y$ and Z$ because the program uses these string variables. You can type eg.:

LET A$ = "TEXT" N/L, LET B$ = "TEXT" N/L, DIM A$(10,10) N/L, LET A$(1) = "TEXT" N/L

You return to the menu by typing:

GOTO 0 N/L

When you return to option 7, you can rub out the quotes and type eg.:

A$ + B$ N/L

strings which you have entered before. Z$ holds then

A$ + B$

You can also type: Text, jump over the quote and type:

+ A$ N/L

Z holds then

"TEXT" + A$

When you want to save on tape the string variables or your UDGs, option 9 gives you the opportunity. After typing: 9 N/L during menu mode, the program waits for pressing a key. It gives you the time to set up the tape recorder.

When you want to break out the machine code routine during option 1-3, just press a key a while. It is advisable not to use the "break" key because then you also break out the Basic program. Then it is a habit to type: Run N/L, but then you will clear the variables area. Use always the command Goto 0, and you will get the menu again with the variables still present.

Before you can enter the machine code, you have to make a line with a Rem containing at least 576 bytes. To create this Rem first enter line 1 with a Rem containing 91 dots. Check the number with

PEEK(16511) + PEEK(16512) × 256

The number must be 93:

REM + 91 dots + N/L

Then using the Edit alter the line number so that you become 6 lines with 91 dots. Then type:

POKE 16514 118 N/L
POKE 16515 118 N/L
POKE 16510 0 N/L
POKE 16511 66 N/L

and you have created line 0 with a Rem containing 567 bytes.

PEEK(16514 + 576)

must be 118, check this! Then enter the Basic program hexload. The startaddress is 16524, the endaddress 17089. Save the program on tape after entering the hexadecimal numbers. Then enter:

LET Z$ = "TEXT" N/L, LET L = USR 13524 N/L

and the program should run. Pressing a key a while will bring you back to Basic. When the program doesn't work, check the addresses 16514-17089. ■

Hexloade:

```
  99 REM HEX -LOADER
 100 PRINT "START ADDRESS"
 110 INPUT S
 120 PRINT "FINISH ADDRESS"
 130 INPUT F
 140 FOR N=S TO F STEP 8
 150 LET T=0
 160 PRINT N;" - ";
 170 INPUT A$
 180 PRINT A$;" = ";
 190 INPUT TOT
 200 PRINT TOT
 210 LET Z=0
 220 FOR K=1 TO LEN A$ STEP 2
 230 LET C=(CODE A$(K)-48)*16+CO
DE A$(K+1)-48
 240 LET T=T+C
 250 POKE N+Z,C
 260 LET Z=Z+1
 270 NEXT K
 280 IF TOT=T THEN GO TO 310
 290 PRINT "ERROR - PLEASE INPUT
AGAIN"
 300 GO TO 150
 310 NEXT N
```

Basic program.

```
  1 REM ************************
  2 REM *(C) FRANS ZIJM        *
  3 REM *  NEWSMONGER          *
  4 REM ************************
 20 SLOW
 30 PRINT "    MENU":,,,,
 40 PRINT "1 CHARACTER SIZE 8x8
":,,
 50 PRINT "2 CHARACTER SIZE 16x
16":,,
 60 PRINT "3 CHARACTER SIZE 16x
24":,,
 70 PRINT "4 USER DEFINED GRAPH
IC":,,
 80 PRINT "5 FILL CHARACTER":,,
 90 PRINT "6 SPEED":,,,
100 PRINT "7 INPUT TEXT":,,,
110 PRINT "8 TOP LINE NUMBER":,
,
120 PRINT "9 SAVE"
130 PRINT AT 21 0;"YOUR OPTION?
"
140 DIM Y$(1)
150 INPUT Y$
160 IF Y$<"1" OR Y$>"9" THEN GO
TO 150
170 CLS
180 IF Y$="9" THEN GOTO 9000
190 GOSUB VAL Y$+1000
200 CLS
210 GOTO 20
1000 POKE 16697,1
1010 POKE 16676,33
1020 POKE 16732,8
1030 LET L=USR 16524
1040 RETURN
2000 POKE 16697,2
2010 POKE 16676,65
2020 IF PEEK 16656)9 THEN POKE 1
6655,9
2030 POKE 16732,16
2040 LET L=USR 16524
2050 RETURN
3000 POKE 16697,2
3010 POKE 16676,99
3020 POKE 16656,1
3030 POKE 16732,24
3040 LET L=USR 16524
3050 RETURN
4000 PRINT "YOU CAN DEFINE YOUR
OWN GRAPHIC.
4010 PRINT "FOR UDG ARE THE ""SH
IFTED""
4020 PRINT "CHARACTERS A,S,D,F,G
,H,J,K,L,
4030 PRINT "Z,X AND C AVAIABLE.Y
OU CAN ALSO"
4040 PRINT "ALTER THE LOWER CASE
 CHARACTERS."
4050 PRINT "REMEMBER THE ""F
UNCTION"" CHA-
4060 PRINT "RACTERS PLUS ""SHIFT
ED"" H.THE"
4070 PRINT "EMPTY STRING WILL RE
TURN YOU TO"
4080 PRINT "THE MENU."
4090 PRINT AT 20 0;"UP=CH ""SHIFT
ED""=CHARACTER OR ""FUNCTION"""
4100 PRINT "CHARACTER"
4110 DIM Y$(1)
4120 INPUT Y$
4130 IF Y$="" THEN RETURN
4140 IF Y$="INKEY$" OR Y$="PI" O
R Y$="RND" THEN GOTO 4160
4150 IF Y$<"AT" THEN GOTO 4100
4160 CLS
4170 LET S=0
4180 IF Y$="INKEY$" OR Y$="PI" O
R Y$="RND" THEN LET S=16384
4190 LET S=S+15224+CODE Y$*8
4200 PRINT "INPUT P FOR A BLACK
SQUARE,THE"
4210 PRINT "EMPTY STRING FOR A S
PACE.A DOT"
4220 PRINT "WILL MARK THE PLACE.
INPUT 0 AT"
4230 PRINT "THE BEGINNING OF A L
INE WILL"
4240 PRINT "PLACE 5 SPACES IN TH
E LINE."
4250 FOR I=1 TO 0
4260 PRINT TAB I;I;
4270 NEXT I
4280 PRINT
4290 FOR I=0 TO 7
4300 PRINT I+1;
4310 LET T=0
4320 FOR J=7 TO 0 STEP -1
4330 INPUT Y$
4340 IF J=7 AND Y$="0" THEN PRIN
T "........
4350 IF J<7 AND Y$="0" THEN GOTO
 4420
4360 IF Y$="P" THEN LET T=T+2^J
4370 IF Y$="P" THEN LET Y$="■"
4380 IF Y$=" " THEN LET Y$="."
4390 IF Y$<>"■" AND Y$<>"." THEN
 GOTO 4330
4400 PRINT Y$;
4410 NEXT J
4420 POKE S+I,T
4430 PRINT
4440 NEXT I
4450 RETURN
5000 PRINT "YOU CAN FILL THE GIA
NT LETTER"
5010 PRINT "WITH A CHARACTER OF
YOUR CHOISE."
5020 PRINT "THE PRESENT FILL CHA
RACTER:" CHR$ PEEK 16690 "."
5030 PRINT "THE EMPTY STRING WIL
L NOT ALTER
5040 PRINT "THE CHARACTER."
5050 PRINT AT 21,0;"YOUR OPTION?
"
5060 DIM Y$(1)
5070 INPUT Y$
5080 IF Y$="" THEN RETURN
5090 IF Y$>"Z" AND Y$<"■" OR Y$>
"■" THEN GOTO 5070
5100 POKE 16690,CODE Y$
5110 RETURN
6000 PRINT "YOU CAN ALTER THE SP
EED,THE"
6010 PRINT "PRESENT SPEED ON A S
CALE 0-9 ";PEEK 16751/2-11;"."
6020 PRINT "THE EMPTY STRING WIL
L NOT ALTER"
6030 PRINT "THE NUMBER."
6040 PRINT AT 21,0;"YOUR OPTION
ON THE SCALE 0-9 "
6050 DIM Y$(1)
6060 INPUT Y$
6070 IF Y$="" THEN RETURN
6080 IF Y$<"0" OR Y$>"9" THEN GO
TO 5060
6090 POKE 16751,(VAL Y$+1)*2
6100 RETURN
7000 POKE 16410,0
7010 PRINT "YOU CAN ENTER YOUR T
EXT,Z$ IS"
7020 PRINT "USED TO STORE THE IN
PUT.YOU CAN"
7030 PRINT "INPUT CHARACTERS,INV
ERSE -,"
7040 PRINT "GRAPHICS -,""SHIFTED
"" - AND"
7050 PRINT """FUNCTION"" -.THE "
"FUNCTION"""
7060 PRINT "CHARACTERS REPRESENT
 THE LOWER"
7070 PRINT "CASE CHARACTERS.EXCE
PTION:THE"
7080 PRINT """SHIFTED"" KEY H RE
PRESENT LOWER"
7090 PRINT "CASE U.THE ""SHIFTED
"" KEYS A,S,"
7100 PRINT "D,F,G,J,E,R,T,Y,2,3
AND 4 ARE"
7110 PRINT "USED FOR LOG.SEE OPT
ION 4."
7120 PRINT "PRESS A KEY TO CONTI
NUE"
7130 IF INKEY$="" THEN GOTO 7130
7140 CLS
7150 POKE 16418,2
7160 PRINT AT 21,0;"YOUR TEXT?
7170 INPUT Z$
7180 RETURN
8000 PRINT "YOU CAN CHOOSE THE P
LACE OF THE"
8010 PRINT "TEXT ON THE SCREEN.
FOR OPTION "
8020 PRINT "1 THE TOP LINE CAN V
ARY 1-17,"
8030 PRINT "FOR OPTION 2 THE TOP
 LINE CAN"
8040 PRINT "VARY 1-9.FOR OPTION
3 THE TOP"
8050 PRINT "LINE WILL BE 1.THE P
RESENT TOP"
8060 PRINT "LINE NUMBER:";PEEK 1
6655;".THE EMPTY STRING"
8070 PRINT "WILL NOT ALTER THE N
UMBER."
8080 PRINT AT 21,0;"YOUR OPTION?
"
9000 DIM Y$(2)
9100 INPUT Y$
9110 IF Y$="" THEN RETURN.
9120 IF VAL Y$>1 OR VAL Y$>17 TH
EN GOTO 9100
9130 POKE 16656,VAL Y$
9140 RETURN
9900 PRINT AT 20,0;"PRESS A KEY
TO RECORD BUT DO NOT"
9910 PRINT "PRESS THE ""BREAK"" KE
Y."
9920 IF INKEY$="" THEN GOTO 9920
9930 CLS
9940 SAVE "NEWSMONGER"
9950 GOTO 0
```

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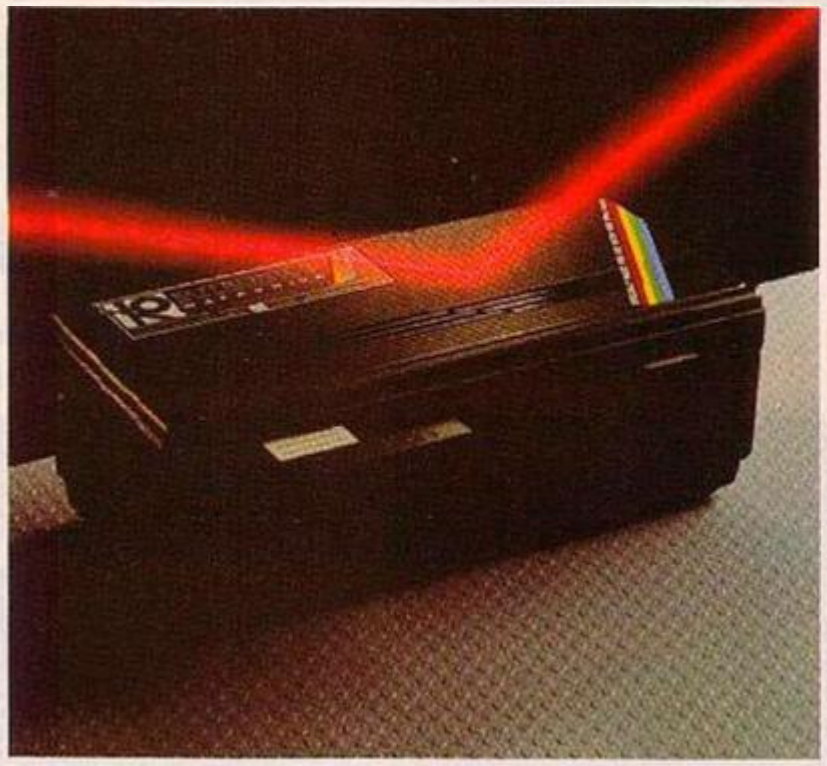


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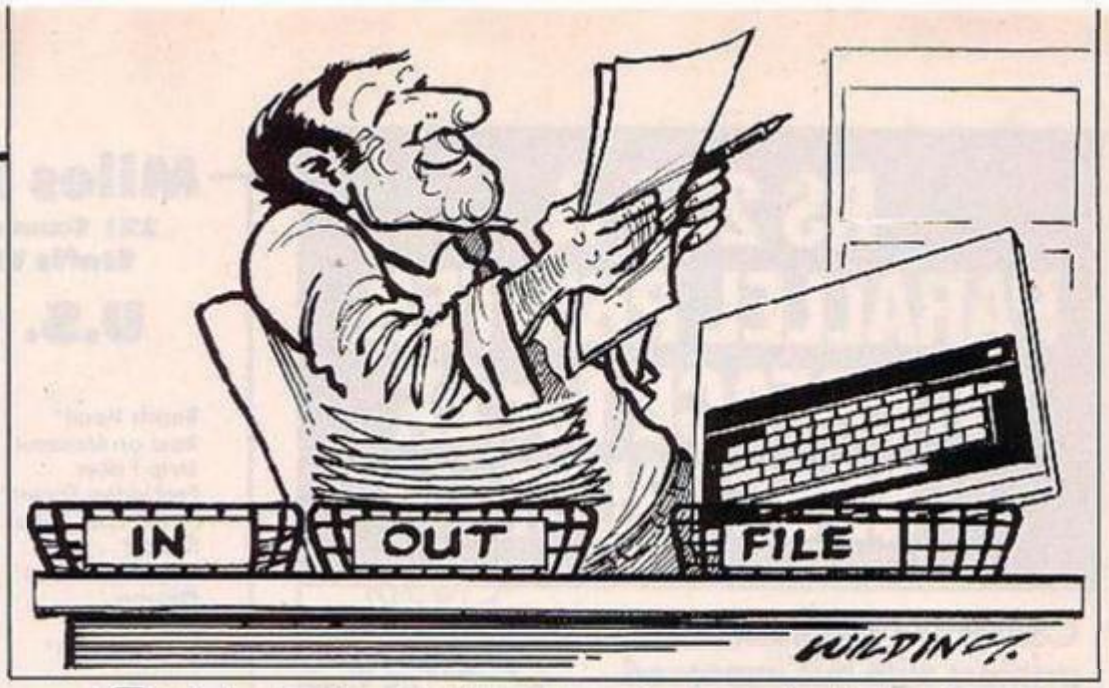
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SUPERFILE

BA Naylor and DW Boyce and a BBC database.

SUPERFILE IS a versatile database written for the BBC Micro 32K model. This may be used for various applications ranging from the small home-based business to the family's video cassette library. The question is often asked what a database actually is. In short, it may be described as a computerised filing cabinet that allows rapid data collection and retrieval.

Data is stored on cassette in the form of a file, each file being split up into records, each of these records being further divided into individual items of data called fields. It is advisable to become acquainted with these terms as they are used many times in this article.

Superfile has a capacity of up to 10 fields each with up to 25 characters, allowing 65 records with this configuration, or two fields with 325 records, these being the two extremes of the system. It is obvious therefore, that the number of records is calculated by divicing 650 by the number of fields entered.

Incorporated in the system is a unique Sort which can rapidly arrange records in order alphabetically or numerically, with the user choosing the field to be sorted. Another great asset to the system is the multi function Search procedure. This allows the full use of equalities to seek a particular item in the file.

The whole system has been very efficiently designed and programmed to aid the user and process the data as quickly as possible. On

(continued on page 117)

```
   10REM SUPERFILE Database
   20REM by B A Naylor and
   30REM     D W Boyce
   70MODE7
   80SE=0:ST=0:r=1:red=0:head=0
   90*OPT3,5
  100*OPT1,1
  110PROCin:PROCm
  120DEFPROCin:PRINTTAB(0,0);CHR$132;CHR$157;CHR$131;C
HR$141;"    SUPER  FILE";CHR$133;"  Data Base.":PRINTTA
B(0,1);CHR$132;CHR$157;CHR$130;CHR$141;"    SUPER  FILE
";CHR$:29;"  Data Base."
  130PRINTTAB(0,22);CHR$132;CHR$157;CHR$131;CHR$141;"
 B A Naylor  &  D W M Boyce.":PRINTTAB(0,23);CHR$132;C
HR$157;CHR$130;CHR$141;"  B A Naylor  &  D W M Boyce."
:VDU28,0,21,39,3
  140PROCh("Set_Up")
  150PRINTCHR$134;"The no. of Fields :":PROCi(20,3,2,"
I"):F=VAL(s$)
  160PRINT:IF F>10 ORF<2 THENPROCn:PRINTCHR$129;"Field
s (2 to 10). Try again.":IN=GET:GOTO140
  170R=INT(650/F)
  180PRINTCHR$:34;"The max no. of Records :";R
  190 PRINTCHR$134;"Are you happy with this (Y/N) ?":I
N$=GET$:IF IN$="N" THEN 140
  200DIMA$(F,R),GI$(F),no(F),label$(F),ITEM$(F),AL(F),
MATCH(R),tot(F):f$="":FOR I%=1 TO F:SI$(I%)="S":no(I%)
=25:label$(I%)="...":NEXT:FOR I%=1 TO F:MATCH(I%)=0:NE
XT:ENDPROC
  210DEFPROCm:PROCh("Menu"):PRINT'CHR$130;SPC(8);'(1)
   Filename.":PRINTCHR$130;SPC(8);"(2)     Define Field
s.":PRINTCHR$130;SPC(8);"(3)     Load File.":PRINTCHR$1
30;SPC(8);"(4)     Save File.":PRINTCHR$130;SPC(8);"(5)
    Edit File."
  220PRINTCHR$130;SPC(8);"(6)     Sort.":PRINTCHR$130;S
PC(8);'(7)     Search.":PRINTCHR$130;SPC(8);"(8)     Dis
play File.":PRINTCHR$130;SPC(8);"(9)     Printer Dump."
:PRINTCHR$130;SPC(8);":0)     Start Again.":REPEAT:IN$=
GET$:UNTIL IN$>="0" AND IN$<="9"
  230IFIN$='1"THENPROCf ELSEIFIN$="2"THENPROCdf ELSEIF
IN$="3"THENPROCio ELSEIFIN$="4"THENPROCsa ELSEIFIN$="5
"THENPROCed ELSEIFIN$="6"THENPROCso ELSEIFIN$="7"THENP
ROCse ELSEIFIN$="8"THENPROCdi ELSEIFIN$="9"THENPROCp E
LSEIFIN$="0"THENPROCst
  240PROCm
  250DEFPROCf:PROCh("Filename"):PRINTCHR$131;SPC(5);"F
ilename <";f$;TAB(26,3);">":IF f$="" THEN 260 ELSE 290
  260PROCi(16,3,10,"S")
  270f$=s$
  280PRINTTAB(0,6);CHR$131;"Do you wish to change the
filname (Y/N)":IN$=GET$:IF IN$="Y' THEN 260 ELSE ENDPR
OC
  290DEFPROCh(h$):CLS:PRINTTAB(16-(LEN(h$)/2),0);CHR$1
29;CHR$141;h$:PRINTTAB(16-(LEN(h$)/2),1);CHR$129;CHR$1
41;h$:PRINT:ENDPROC
  300DEFPROCdf:IFred>=1 THEN ENDPROC ELSE PROCh("defin
e_fields"):PRINTCHR$134;"Field";SPC(2);"Type";SPC(2);"
No. chrs";SPC(4);"Label":FOR I%=1 TO F:PRINTCHR$131;TA
B(2);I%-1;TAB(9);SI$(I%);TAB(16);no(I%);TAB(27);label$
(I%):NEXT
  310PRINTTAB(0,16);CHR$131;"Press (A) to edit all Fie
lds or (0_";F-1;")":PROCgb:PRINTTAB(2,15);CHR$133;"S=S
tring  I=Integer  N=Numeric."
  320IN$=GET$
  330IF IN$="A" OR IN$="a"THEN F%=1:F2=F:GOTO420
  340IF IN$=" " ENDPROC
  350F$=STR$(F-1)
  360IF IN$<"0" OR IN$>F$ THEN 380
  370 GOTO400
  380IF ASC(IN$)<>13 THEN PROCn
  390GOTO310
  400IF IN$="0" THEN F1=1:F2=1:GOTO420
  410F1=VAL(IN$)+1:F2=F1
  420head=1:FOR I%=F1 TO F2
  430PROCi(9,3+I%,1,"S")
  440IF s$="S" OR s$="I" OR s$="N" THEN SI$(I%)=s$ ELS
E PROCn:GOTO430
  450PROCi(14,3+I%,2,"I")
  460IF VAL(s$)>0 AND VAL(s$)<26 THEN no(I%)=VAL(s$) E
LSE PROCn:GOTO450
  470PROCi(27,3+I%,8,"S"):label$(I%)=s$:NEXT
  480 GOTO 330
  490DEFPROCi(X%,Y%,L%,t$)
  500I%=0:s$="":red1=1:VDU 23,1,1;0;0;0;
  510PRINTTAB(X%,Y%);STRING$(L%," ")+STRING$(L%,CHR$12
7);:GOTO 530
  520PROCn
  530IN$=GET$:in%=ASC(IN$):IF in%=13 THEN 670
  540IF in%=127 THEN 550 ELSE 560
  550X=POS:IF X>X% THEN PRINTIN$;:I%=I%-1:s$=LEFT$(s$,
I%):GOTO530 ELSE 520
  560IF I%=L% THEN 520
  570IF t$="S" THEN 620
  580IFt$="I" THEN 610
  590IF t$="N" THEN 600
  600IF in%>39 AND in%<63 OR in%=127 THEN630 ELSE 520
  610IF in%>47 AND in%<58 OR in%=127 THEN630 ELSE 520
  620IF in%>31 AND in%<128 THEN 630 ELSE520
  630s$=s$+IN$:I%=I%+1
  640PRINTIN$;:IF I%=L% THEN 530 ELSE 530
  650IF s$=" " THEN 520
  660I%=I%-1:s$=LEFT$(s$,I%):GOTO 640
  670VDU 23,1,0;0;0;0;:ENDPROC
  680DEFPROCn:SOUND1,-10,0,5:ENDPROC
  690DEFPROCso:IF red<1THEN PROCd:ENDPROC
  700PROCh("Sort"):PRINT'':FORM%=1TOF:PRINTCHR$132;SPC
(4);M%-1;CHR$134;label$(M%):NEXT:PRINTTAB(0,3):CHR$134
;"Field for sorting (0_";F-1;") :";CHR$132;
  710PROCi(27,3,1,"I"):IF s$="" THEN PROCn:GOTO710 ELS
E Field%=VAL(s$)+1:IF Field%>F THEN PROCn:GOTO710
  720PRINTTAB(27,3);Field%-1:PRINTTAB(20,5+Field%);CHR
$136;CHR$129;'SORTING':N%=R:D%=1
  730D%=2*D%
  740IFL%<N% THEN730
  750D%=D%-1
  760D%=D% DIV 2
  770IFD%=0 THEN880
  780I%=N%-D%
  790FOR1%=1 TOI1%
  800J%=I%
  810 %=J%+D%
  820IF SI$(Field%)="S" THEN 850
  830IF VAL(A$(Field%,L%))>VAL(A$(Field%,J%)) THEN PRO
Cs:J%=J%-D%:IFJ%>0 THEN810
```

(listing continued on page 113)

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(continued from page 111)

many options, output may be directed to the printer or to the screen. Only Parallel printers have been catered for in this version of Superfile. Options are accessed through a menu.

The great beauty of the database is its user friendliness, so that even the youngest member of the family may easily exploit the system.

(1) Filename: To enter this option simply press 1 on the keyboard, and immediately the computer will ask you to enter a filename. A filename is the label given to your data when it is stored on cassette.

If you have previously entered a filename, then you will be asked about whether you wish to change it. Pressing Y will allow you to input up to 10 characters for the filename. Any other key will return the user to the menu enabling them to use the options. If must be noted, however, that a filename is required if you wish to enter the options of Load (3) and Save (4).

(2) Define fields: This is the most essential option of the database, it must be entered before any data can be inputted via the Edit option. This is basically because it defines areas in memory for information to be stored, and thus is the crux of the program.

There are three main items of data to be entered in each field, these are:

- The type of data you wish to store in each field, ie., String variables — letters and numbers, integers — whole numbers — and numerics — real numbers.
- The maximum number of characters allowed to be stored in each field — with a maximum of 25 characters per field.
- The label given to each field which identifies the contents of the field when displayed. The maximum number of characters allowed is eight.

To enter these important pieces of data you can either press the relevant field number or press A to enter every field. At any time pressing the space bar will return the user to the menu.

(3) Load: This option loads the previously stored data into the computer so that it may be processed. It is essential to input the correct number of fields for the file you wish to load, otherwise the computer will not accept the file, and the user will be informed. In this case, a message is displayed that tells the user to start again via option 0, and redefine the fields to the correct value if you wish to load this particular file.

To actualy enter a file, the user must press L and then the usual searching message is displayed on the screen. The normal procedure for loading a program is then observed — refer to User Guide if unsure.

When the file has been loaded, pressing the space bar will return the user to the menu.

(4) Save: Both options Load (3) and Save (4) need to have a filename entered, before you can access them, if not the 'No Filename' message will be displayed with instructions for the appropriate actions to take.

This Save option obviously stores the data on tape, and is operated by pressing S on the keyboard. After this, the "Record then Return" message is displayed, at which point a cassette must be inserted into the tape recorder. The usual procedure for saving programs is then followed.

As with most options in this database, pressing the space bar will return the user to the menu.

(continued on next page)

(listing continued from page 115)

```
  840GOTO860
  850IFA$(Field%,L%)>A$(Field%,J%) THEN PROCs:J%=J%-E%
:IFJ%>0 THEN810
  RAMNEXT
  870GOTO760
  880PROCg
  890PRINTTAB(20,5+Field%);CHR$130;" SORTED ":PROCr:EN
DPROC
  900DEFPROCed:PROCh:"Edit"):IF head=0 THEN PROCnh:END
PROC
  Y1dr=IN!(r):PRINTTAB(34,2);"     ":PRINTTAB(0,2);CHR$
131;"(N) for next record.";CHR$130;" (R)-RECORD:";r
  920IF r>R THEN PROCn:r=R:GOTO910
  930 IFr<1 THEN r=1:GOTO910
  940FORI%=1TOF:PRINTTAB(0,3-I%);CHR$131;I%-1;CHR$134;
label$(I%);TAB(11,3+I%);CHR$:31;"<";STRING$(25,"  ")+ST
R:NG$(25,CHR$127);A$(I%,r);TAR(13+no(I%),3+I%);">":NFX
T
  950PRINTTAB(4,15);CHR$131;"(E) to erase current reco
rd":PROCgb:PRINTTAB(2,16);CHR$131;"(A) to edit all fie
lds or (0_";F-1;")."
  960IN$=GET$
  970IFIN$="N" OR IN$="n" THEN r=r+1:GOTO910
  980IFIN$="R" OR IN$="r" THEN PROCi:34,2,4,"I"):r=VAL
(s$):GCTO910
  990IFIN$="A" OR IN$="a"THENF1=1:F2=F:3OTO1100
 1000IF IN$="E" OR IN$="e" THEN 1010 ELSE 1020
 1010FORI%=1 TC F:A$(I%,r)="":NEXT:MATCH(r)=0:GOTO940
 1020IFIN$=" "THENENDPROC
 1030F$=STR$(F-1)
 1040IFIN$<"0"ORIN$>F$THEN1060
 1050GOTO1080
 1060IFASC(IN$)<>13THENPROCn
 1070GOTO960
 1080IFIN$="0"THENF1=1:F2=1:GOTO1100
 1090F1=VAL(IN$)+1:F2=F1
 1100FORI%=F1 TOF2:IF FNmem<200 THEN PROCnm:ENDPROC EL
SE PROCi(13,3+I%,no(I%),SI$(I%)):A$(I%,r)=s$
 1110IF ASC(s$)=-1 THEN 1120 ELSE red=1:MATCH(r)=2
 1120NEXT
 1130GOTO940
 1140DEFPROCnh:PROCh("Fields Undefined"):PROCn:PRINTCH
R$129;"  You have not defined the fields.";PRINTCHR$12
9;SPC(5);"Please do so via option (2).":PRINT:PROCr:EN
DPROC
 1150DEFPROCst:PROCh("Check"):PRINTCHR$129;SPC(8);"Are
 you sure (Y/N)?":IN$=GET$:IF IN$="N" THEN ENDPROC ELS
E CLEAR:GOTO70:ENDPROC
 1160DEFPROCnf:PROCh("Filename Undefined"):PROCn:PRINT
CHR$129;"  You have not defined a filename.";PRINTCHR$
129;SPC(5);"Please do so via option (1).":PROCr:ENDPRO
C
 1170DEFPROCsa:IF red<1 THEN PROCd:ENDPROC ELSE IF fs=
"" THEN PROCnf:ENDPROC ELSE PROCh("Save"):PRINTCHR$133
;SPC(5);" Press (S) to save the data.":PROCgb
 1180IN$=GET$:IF IN$="S" THEN 1190 ELSE IF IN$=" " THE
N ENDPROC ELSE 1180
 1190VDU28,5,12,25,8:Z%=OPENOUT (f$):PRINT#Z%,F,R:FOR
I%=1 TO F:PRINT#Z%,SI$(I%),no(I%),label$(I%):NEXT:FOR
I%=1 TO R:PRINT#Z%,MATCH(I%):FOR N%=1 TO F:PRINT#Z%,A$
(N%,I%):NEXT N%,I%:CLOSE#Z%:VDU28,0,21,39,3:PROCr:ENDP
ROC
 1200DEFPROCdi:IF red<1 THEN PROCd:ENDPROC ELSE PROCh(
"Display"):PRINTCHR$130;SPC(2);"Press <RETURN> to view
 each file.":VDU28,1,17,38,7:PROCps:VDU28,0,21,39,3:PR
OCr:ENDPROC
 1210DEFPROCps:IF SE=1 THEN SE1=2 ELSE SE1=1
 1220FOR I%=1 TO R:IF MATCH(I%)=0 OR MATCH(I%)=SE1 THE
N 1300
 1230IF MATCH(I%)=0 OR MATCH(I%)=SE1 THEN 1300
 1240IN$=GET$:IF ASC(IN$)=13 OR ASC(IN$)=32 THEN 1250
ELSE PROCn:GOTO 1240
 1250IF ASC(IN$)=13 THEN CLS ELSE ENDPROC
 1260PRINT'CHR$129;"Record:";I%
 1270FOR N%=1 TO F
 1280PRINTCHR$133;label$(N%);TAB(10);":";CHR$131;A$(N%
,I%)
 1290NEXT N%
 1300NEXT I%
 1310PROCtot:ENDPROC
 1320DEFPROCr:PRINTTAB(0,17);CHR$131;"  Press <SPACE>
To return to";CHR$129;"MENU."
 1330IN$=GET$:IF IN$=" " THEN ENDPROC ELSE 1330
 1340DEFPROCgb:PRINTTAB(0,17);CHR$131;"  Press <SPACE>
 To return to";CHR$129;"MENU.":ENDPROC
 1350DEFPROClo:IF fs="" THEN PROCnf:ENDPROC ELSE PROCh
("Load"):PRINTCHR$133;SPC(5);"Press (L) to load new fi
le.":PROCgb
 1360IN$=GET$:IF IN$=" " THEN ENDPROC
 1370IF IN$="L" OR IN$="l" THEN 1380 ELSE PROCn:GOTO13
60
 1380PROCc:VDU28,5,12,25,8:Z%=OPENIN (f$):INPUT#Z%,F4,
R4:PROCck:IF F4<>F THEN ENDPROC
 1390FOR I%=1 TO F
 1400INPUT#Z%,SI$(I%),no(I%),label$(I%)
 1410NEXT
 1420FOR I%=1 TO R
 1430INPUT#Z%,MATCH(I%)
 1440FOR N%=1 TO F
 1450INPUT#Z%,A$(N%,I%)
 1460NEXT N%,I%
 1470CLOSE#Z%
 1480VDU28,0,21,39,3
 1490red=1:head=1
 1500PROCr:ENDPROC
 1510DEFPROCck:IF F4=F THEN ENDPROC ELSE VDU28,0,21,39
,3:PROCh:"Mismatch"):PRINTCHR$130;"If you wish to acce
ss this file then":PRINTCHR$130;"you must redefine the
 no. of fields to":PRINTCHR$130;"be :";CHR$133;F4;CHR$
130;"only. This will give you :";
 1520PRINTCHR$133;R4:PRINTCHR$130;"records and will be
 compatible with':PRINTCHR$130;"the file you wish to l
oad.Please do so':PRINTCHR$130;"via option (0).":PROCr
:ENDPROC
 1530DEFPROCc:FORX%=1 TO F:FORI%=1 TO R:A$(X%,J%)="":N
EXTJ%,X%:ENDPROC
 1540DEFPROCp:IF red<1 THEN PROCc:ENDPROC ELSE PROCh("
Printer_dump")
 1550*FX5,1
 1560*FX6,0
```

(listing continued on next page)

(continued from previous page)

(5) Edit file: The fifth option in the menu is the edit procedure which allows the altering and adding of data to the file. All data is initially entered via this option.

Once the user has accessed this section of the system, the fields defined will be displayed followed by the space provided for the number of characters as defined in option 2 for the field. Altering data in a particular field may be achieved by typing the field number allowing data to be entered in the space provided.

Alternatively, the whole record can be entered by pressing A. Erasing a whole record may be achieved by pressing E. To access the next record simply press N or if you wish to edit a particular record press R followed by the record number and Return. Again the space bar will return you to the menu.

(6) Sort: The sort option enables the user to put the file in order according to any of the fields defined in option 2.

If the field has been defined as numeric or integer then the order will be of the algebraic nature, otherwise the file will be ordered according to character values.

Using the sort option requires only one entry; the user must choose the field on which the sort is to be based. Once the sorting is complete the user will be able to return to the menu in the normal way.

(7) Search: This is probably the most useful facility of any database. However, Superfile has a remarkably efficient and rapid search that is enhanced by its special mixture of machine code and hybrid Basic.

Search criteria used are the widely accepted mathematical in-equalities — these are as follows:

1 > : greater than.
2 < : less than.
3 = : equal to.
4 > = : greater than and equal to.
5 < = : less than and equal to.
6 < > : not equal to.

For the "equal to" sign, the user may enter part of a string/number, and then the computer will search for all occurrences of the comparison. Only one search criteria may be entered per field, but many fields can have comparisons thus performing a multisearch function.

The number of items that the computer has found which satisfy the conditions defined is printed on the screen as they are found. These records can then be seen either on the screen or in the form of a printout on the printer. Screen and printer output are explained in options 8 and 9.

(8) Display: This option is used to print the records on the screen, these may only be displayed if they contain data. Pressing Return will allow you to view the next record. When all records have been displayed, the totals of the numbers stored in the integer and numeric fields will also be printed up.

(9) Printer dump: As explained earlier, this version of Superfile can only cater for Parallel printers. We advise that you only use this option if you have a printer connected, otherwise the computer may appear to have crashed.

(0) Start again: This option is used if the user decides to change the format of the file, or if he just wishes to clear the memory. The computer asks you whether you wish to change your mind, just as a precaution before the computer clears the entire memory. ■

(listing continued from previous page)

```
 1570PRINTCHR$131;" Press <RETURN> to view each record
":PROCgo:VDU28,0,19,39,7:CLS:VDU2
 1580 IF SE=1 THEN SE1=2 ELSE SE1=1
 1590FORI%=1 TO R
 1600IF MATCH(I%)=0 OR MATCH(I%)=SE1 THEN 1650
 1610IN$=GET$:IF IN$=" " OR ASC(IN$)=13 THEN 1620 ELSE
 PROCn:GOTO1610
 1620IF IN$=" " THEN VDU3:VDU28,0,21,39,3:ENDPROC
 1630PRINTCHR$129;"Record:";CHR$133;I%:FORN%=1 TO F:PR
INTCHR$129;label$(N%);TAB(9);CHR$133;":";A$(N%,I%):NEX
TN%
 1640PRINT
 1650NEXTI%
 1660PROCtot:VDU3:VDU28,0,21,39,3:PROCr:ENDPROC
 1670DEFPROCse:IF rec<1 THEN PROCd:ENDPROC ELSE PROCh(
"Search"):SE=1:PRINTTAB(0,2);CHR$130;"Field";TAB(8,2);
"Equality";TAB(20,2);"Comparison"
 1680FORX%=1 TO F
 1690PRINTTAB(0,3+X%);CHR$134;label$(X%);CHR$132;:PRIN
TTAB(12,3+X%);CHR$134;"(";SPC(no(X%));")"
 1700NEXT
 1710FORX%=1 TO F
 1720Value=0
 1730PROCi(10,3+X%,2,"S")
 1740IF s$="" THEN 1810
 1750IF s$="<" THEN Value=1 ELSE IF s$=">" THEN Value=
2 ELSE IF s$="=" THEN Value=3 ELSE IF s$="<>" THEN Val
ue=4 ELSE IF s$="<=" THEN Value=5 ELSE IF s$=">=" THEN
 Value=5 ELSE PROCn:GOTO1730
 1760IF SI$(X%)="N" OR SI$(X%)="I" THEN Value=Value+6
 1770AL(X%)=Value
 1780PROCi(14,3+X%,no(X%),SI$(X%))
 1790IF s$="" THEN PROCn:GOTO1780
 1800ITEM$(X%)=s$
 1810NEXT
 1820F1=0
 1830FORX%=1 TO F:IF AL(X%)>=1 THEN F1=1
 1840NEXT
 1850IFF1=1 THEN1880
 1860PROCn:PRINTTAB(0,15);CHR$129;"You cannot search f
or any items as you":PRINTCHR$129;" have not defined a
ny comparisons."
 1870PROCr:GOTO2180
 1880PRINTTAB(3,15);CHR$133;"Are you happy with this (
Y/N)?"
 1890IN$=GET$:IF IN$="N"THEN PRINTTAB(3,15);SPC(35);:F
ORI%=1 TO F:AL(I%)=0:NEXT: GOTO 1670 ELSE IF IN$="Y" T
HEN GOTO 1900 ELSE GOTO 1890
 1900CLS:T=0:FAIL=0:PRINTTAB(12,6);CHR$129;CHR$141;"MA
TCHED ";T:PRINTTAB(12,7);CHR$129;CHR$141;"MATCHED ";T
 1910FORX%=1 TO R
 1920IF MATCH(X%)=0 THEN 2110
 1930FORJ%=1 TO F
 1940IF AL(J%)=0 THEN 2070
 1950ON AL(J%) GOTO 1960,1980,2000,2010,2030,2050,1970
,1990,2000,2020,2040,2060
 1960IF A$(J%,X%)<ITEM$(J%) THEN 2070 ELSE FAIL=1:GOTO
2070
 1970IF VAL(A$(J%,X%))<VAL(ITEM$(J%)) THEN 2070 ELSE F
AIL=1:GOTO2070
 1980IF A$(J%,X%)>ITEM$(J%) THEN 2070 ELSE FAIL=1:GOTO
2070
 1990IF VAL(A$(J%,X%))>VAL(ITEM$(J%)) THEN 2070 ELSE F
AIL=1:GOTO2070
 2000Z=INSTR(A$(J%,X%),ITEM$(J%)):IF Z<>0 THEN2070 ELS
E FAIL=1:GOTO2070
 2010IF A$(J%,X%)<>ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
O2070
 2020IF VAL(A$(J%,X%))<>VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
 2030IF A$(J%,X%)<=ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
O 2070
 2040IF VAL(A$(J%,X%))<=VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
 2050IF A$(J%,X%)>=ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
O2070
 2060IF VAL(A$(J%,X%))>=VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
 2070NEXTJ%
 2080IF FAIL=1 THEN FAIL=0:GOTO 2110
 2090MATCH(X%)=1
 2100T=T+1:PRINTTAB(22,6);T:PRINTTAB(22,7);T
 2110NEXT(%
 2120PRINTTAB(2,17);CHR$133;"Printer or screen output
(P/S)?"
 2130IN$=GET$:IF IN$="P" OR IN$="S" THEN2140 ELSE GOTO
 2130
 2140 IF IN$="P" THEN PROCp ELSE PROCdi
 2150FOR I%=1 TO R
 2160IF MATCH(I%)>=1 THEN MATCH(I%)=2
 2170NEXT
 2180SE=0:FORI%=1TOF:AL(I%)=0:ITEM$(I%)="":NEXT
 2190ENDPROC
 2200DEFPROCd:PROCn:PROCh("No_Data"):PRINTCHR$129;"You
 can't enter this option before you":PRINTCHR$129;"hav
e inputted any data. Please do so":PRINTCHR$129;"via o
ption (5).":PROCr:ENDPROC
 2210DEFPROCs:m=MATCH(L%):MATCH(L%)=MATCH(J%):MATCH(J%
)=m:FORK%=1 TO F:S$=A$(K%,J%):A$(K%,J%)=A$(K%,L%):A$(K
%,L%)=S$:NEXT:ENDPROC
 2220DEFPROCg:J%=0:REPEAT:X%=X%+1:UNTIL MATCH(X%)<>2:Y
%=X%-1:FOR K%=1 TO (Y% DIV 2):FOR J%=1 TO F:S$=A$(J%,K
%):A$(J%,K%)=A$(J%,Y%-K%+1):A$(J%,Y%-K%+1)=S$:NEXT J%,
K%:ENDPROC
 2230DEFPROCtot:FOR I%=1 TO F:tot(I%)=0:NEXT I%:IF SE=
1 THEN SE1=2 ELSE SE1=1
 2240FOR I%=1 TO R
 2250IF MATCH(X%)=0 OR MATCH(X%)=SE1 THEN 2290
 2260FOR J%=1 TO F
 2270IF SI$(J%)<>"S" THEN tot(J%)=tot(J%)+VAL(A$(J%,X%
)) ELSE 2280
 2280NEXT J%
 2290NEXTI%
 2300CLS:PRINT:PRINTCHR$129;"TOTALS":FOR I%=1 TO F:PRI
NTCHR$133;label$(I%);TAB(11);":";CHR$131;:PROCdec:NEXT
:ENDPROC
 2310DEFFNmem DIM P%-1:=HIMEM -P%
 2320DEFPROCmm:PROCh("Low Memory"):PROCn:PRINTCHR$129;
"Unfortunately you are close to the ":PRINTCHR$129;"me
mory limit. Please save file now.":ENDPROC
 2330DEFPROCdec:IF SI$(I%)="S"THEN PRINTCHR$129"N/A":E
NDPROC ELSE PRINTtot(I%):ENDPROC
>
```

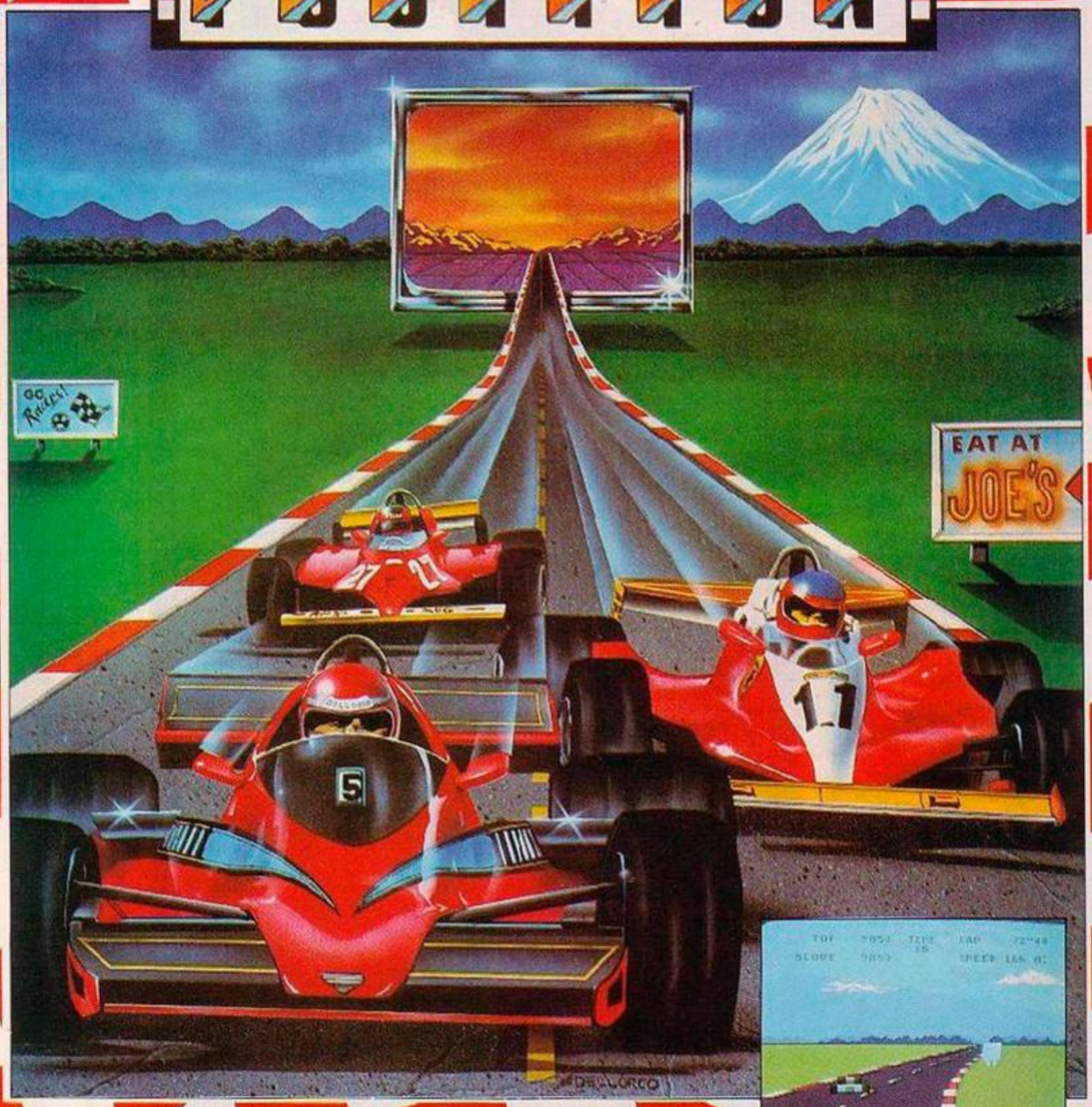

BASIC LIGHTNING
WHITE LIGHTNING
MACHINE LIGHTNING
LIGHTNING STRIKES AGAIN
THREE HIGH POWERED GRAPHICS DEVELOPMENT SYSTEMS FOR THE COMMODORE 64.
Totally dedicated to writing very fast, video games, BASIC Lightning is c is a fully structured extension to the Commodore BASIC which adds a staggering 200 reserved words. It allows up to five tasks to run concurrently (one in foreground and four in background). Most of the commands are dedicated to games writing and the sound and graphics commands are unparalleled. Procedures and PASCAL type structured programming commands are also a feature of BASIC Lightning.
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68008 QL TUTORIAL

Phil Holliday continues his course on assembly language.

LAST MONTH I covered the programming model of the 68008 and its addressing modes. A brief introduction to the instruction set was made and this will be expanded in this article, together with a more complex program example than the one given last month.

I will describe the instruction set under eight general headings, namely data movement, arithmetic, shift and rotate, bit manipulation, binary coded decimal, program control and system control.

The basic Move instruction was covered last month. It has several variants. Move multiple registers — MoveM — allows several registers to be moved to or loaded from memory in one instruction. Move quick — MoveQ — allows an eight bit signed number — i.e. from −128 to +127 — to be sign extended and loaded to a data register.

It is called "quick" as the whole instruction, including the number, is only one word — i.e. two bytes — long. Note there are other quick instructions in the 68008 instruction set.

Move peripheral data — MoveP — transfers data between a data register and alternate bytes of memory, and is intended to simplify the transfer of data between the 68008 and 8 bit peripheral devices. I have not found this a very useful instruction for the QL so far.

Load effective address — LEA — allows an effective address to be computed and stored in an address register. This is a much used instruction and an example will help. Suppose we have opened a channel using a QDOS system call and stored the channel ident returned by the call in a long variable labelled channel. Then to actually load the channel ident into address register a0 we will need a fragment of code such as:

```
LEA channel, a0
MOVE.L (a0),a0
```

Push effective address — PEA — computes an effective address in a similar way to the LEA instruction, but pushes it onto the stack rather than storing it in an address register.

Exchange registers — EXG — exchanges the contents of any register with any other register. Note that the whole 32 bit contents of each register is exchanged.

Link stack — Link — and unlink stack — UNLK — are related instructions. Link causes the current contents of an address register to be pushed onto the stack. The address register is then loaded with the updated contents of the stack pointer and a sign-extended displacement, which is a part of the instruction, is then added to the stack pointer.

This can be used to create a stack frame in which would be stored local data etc, as used in high level languages. UNLK restores the stack and appropriate address register to its state before a Link was executed by loading the stack pointer from the address register and then loading the address register from the top of the stack.

The ADD instruction adds the contents of the destination effective address to the contents of the source effective address and the result is stored in the destination effective address. The addition is binary. As an example suppose that data register d0 contains $100 — i.e. decimal 256 — and that address register a0 points to a variable which contains $200. Then the fragment of code

```
ADD.W (a0),d0
```

will store the result which is $300 in d0. There are several variations on this instruction which are applicable to many other of the arithmetic instructions.

First, we can have Add.B, Add.W and Add.L producing byte, word and long results respectively. Either the destination or the source must be a data register — i.e. it is not possible to add the contents of two memory locations together without first moving one of them into a data register — but see AddX below.

The add address — AddA — instruction is similar to the Add instruction but the desination must be an address register — and so size byte is not allowed. Add immediate — AddI — specifies the source as immediate data, and add quick — AddQ — provides a "quick" immediate add of from 1 to 8.

Add extended — AddX — performs an add of source and destination and the extend bit. It has two versions, either add register to register or add memory to memory.

The extend bit, when affected, is set to the same as the carry bit. It is unaffected by data movement instruction. Note that this allows multiple precision arithmetic.

The subtract instruction — Sub — and all its related instructions, i.e. SubA, SubI, SubQ and SubX work in exactly the same way as their equivalent Add instructions except that the source is subtracted from the destination — and in the case of SubX the extend bit is also subtracted.

Multiplication of two 16 bit numbers to produce a 32 bit result can be either unsigned — MulU — or signed — MulS. One of the multiplicands must be in a data register and the result will be placed in this same data register.

Similarly there are two divide instructions — DivS and DivU — which divide a 32 bit number in a data register by a 16 bit number. The result is a 16 bit quotient in the lower word of the data register and a 16 bit remainder in the upper word of the data register.

The compare — CMP — instruction performs a subtraction of the source from the destination, and sets the condition codes accordingly but does not change the destination. There are also similar compare address — CMPA — compare immediate — CMPI — and compare memory — CMPM — instructions.

Negate — Neg — subtracts the operand from 0 using 2's complement arithmetic. There is also a variation of this instruction using the extend bit (NEGX) for multiprecision arithmetic.

The clear instruction (CLR) clears, i.e. stores zero in, the operand. Note that, as with most instructions in the 68008 instruction set, this instruction does not work with all effective addressing modes. In particular it is not possible to CLR and address register. It is

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often necessary to clear address register a6 as some QDOS system calls require addresses in other registers relative to a6. To do this you can instead use the instruction

SUBA a6,a6

The sign extend instruction — Ext — will sign extend a byte to a word or a word to a long number. Effectively, this means that for a byte to word extend bit 7 will be copied into bits 8 through 15, and similarly for a word to long extend bit 15 will be copied into bits 16 through 31.

The test instruction — TST — compares the operand with zero and sets the appropriate flags. The test and set instruction — TAS — tests the byte operand setting the flags accordingly, and the most significant bit — bit 7 — of the operand is set.

This instruction would normally be used in a multi-processor system for synchronisation of several processors, which does not apply to the QL of course.

The standard logical operations of bitwise and — And — inclusive or — Or — exclusive or — EOr — and invert — Not — are available for byte, word and long size of data. Either the source or the destination must be a data register. There is also a set of immediate instructions, i.e. AndI, OrI and EorI.

Shift and rotate instructions have both right and left versions. There are arithmetic shift — ASL and ASR — and logical shift — LSR and LSL — instructions. ASL and LSL are identical, causing a zero to be shifted into the right hand side as the left shift takes place.

ASR causes the most significant bit to be retained as a right shift takes place, with the least significant bit falling off the end. The LSR instruction is similar, but a zero is shifted in at the left hand end.

The number of bits to be shifted can be specified as either immediate data in the range 1 to 8 bits, or else in a data register in the range 0 to 63 bits.

The rotate instructions have both right and left versions without extend — ROL and ROR — and with extend — ROXL and ROXR. In a rotate instruction the bit which would "fall" off the end is fed back into the opposite end of the register, and also into the carry bit. In the extend version both the carry and the extend bits are affected.

Four extremely useful bit instructions are available on the 68008. The bit to be manipulated can be specified as either immediate data or as a number held in a data register.

The bit test — BTST — instruction tests the state of a specified bit in a register or memory location and reflects it in the zero flag. The bit tested is not modified.

The bit test and set — Bset — instruction tests and reflects the state of the bit in the zero flag and sets the bit to a one.

The bit test and clear — BCLR — tests the bit as in Bset but resets the bit to zero.

Finally, the bit test and change — BCHG — tests the bit and then inverts it.

Three instructions are included which operate on byte sized operands and perform BCD arithmetic. The add decimal with extend instruction — ABCD — adds the source operand and destination operand and extend bit together using BCD arithmetic, placing the result in the destination operand and if necessary setting the extend bit to allow multi-precision BCD arithmetic.

The operands must either both be contained in data registers, or else in memory locations addressed indirectly through address registers. In the case of memory to memory addition only the predecrement addressing mode is available, to facilitate multi-precision addition.

The subtract decimal with extend instruction — SBCD — subtracts the source operand and extend bit from the destination operand using BCD arithmetic. The addressing modes are the same as for the ABCD instruction.

The negate decimal with extend instruction — NBCD — subtracts the destination operand, which is of size byte, and the extend bit, from zero placing the result in the destination. Thus the instruction produces the ten's complement of a BCD number if the extend bit is reset and the nine's complement otherwise.

This month's program example produces a directory of the cartridge in microdrive one and lists the number of sectors taken by each file, something which is not provided for in the normal QL DIR command. I have kept the program down to a reasonable length so as not to obscure the structure unduly. It is quite a simple matter to extend this simple program to give other features such as directory of other



drives, selective listing of groups of files etc.

The parts of the record we are interested in are the file length, which is a long word and is located at the start of the record, and the name of the file which is stored in normal QL string format with the name length stored as a word at bytes 14 and 15 from the start of the record, and the actual name which starts at byte 16.

The program starts by opening channels first to the directory itself and then to the screen, which is the channel used for output, by using the QDOS io-open system call. The cartridge name and count of empty/good sectors is then fetched with QDOS filing system trap fs-mdinf and these details printed. The program then enters a loop.

Within this loop a check is made for the end of file marker from the directory with QDOS call io-pend, exiting if it is found as we have now read the whole directory. If end of file not found the next record is read into a 64 byte buffer. We now test to see if the file length or name length are zero, as if they are it indicates that this is an old file which has been deleted — in this case we branch back to the start of the loop.

If we have a genuine file record we calculate the number of sectors from its length and print the sector count as a decimal number using a QDOS utility call ut-mint. We now move the print position to column four with QDOS screen driver call sd-tab and print the name string using QDOS io call io-sstrg. Finally we send a line feed character to the screen with QDOS io call io-sbyte, and then branch to the top of the loop again.

```
LOC      OBJECT    STMT    SOURCE STATEMENT
                     2
                     3 *Assembled using METACOMCO assembler
                     4
   =0105             5 st_frjob  equ $105
   =0110             6 st_alchp  equ $110
   =0201             7 io_open   equ $201
   =0303             8 io_fstrg  equ $303
   =0305             9 io_sbyte  equ $305
   =0307            10 io_sstrg  equ $307
   =0308            11 io_pend   equ $308
   =0311            12 sd_tab    equ $311
   =0345            13 fs_mdinf  equ $345
   =0347            14 fs_headr  equ $347
                    15
   =00CE            16 ut_mint   equ $CE
                    17
   =00BA            18 lf        equ $0A
   =FFFF            19 this_job  equ -1
   =FFFF            20 inf       equ -1
                    21
                    22 QDOS      macro
                    23           moveq #\1&$FF,d0
                    24           trap  #\1//$100
                    25           tst.l d0
                    26           endm
                    27
                    28 VECTOR    macro
                    29           move.w \1,\2
                    30           jsr (\2)
                    31           tst.l d0
                    32           endm
                    33
                    34
                    35 *main routine
                    36
                    37 *open MDV1_
                    38
0000' 72FF          39 start     moveq #this_job.d1
0002' 7604          40           moveq #4,d3          t=dir
0004' 41FF 0122     41           lea dir_nam,a0       point to mdv1
                    42           QDOS io_open
0008' 7001          42+          moveq #io_open&$FF,d0
000A' 4E42          42+          trap  #io_open/$100
000C' 4A00          42+          tst.l d0
000E' 6600 0104     43           bne err_exi:
                    44
                    45 *now save mdv1_ channel id in d4
                    46
0012' 2840          47           movea.l a0,a4
                    48
                    49 *now open scr_ channel
                    50
0014' 72FF          51           moveq #this_job.d1
```

(listing continued on page 121)

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(listing continued from page 118)

```
0016' 7a02              52          moveq #2,d3         excl device
001E' 4.FA 0116         53          lea scr_name,a0     point to screen
                        54          QDOS io_open
001E' 7001              54+         moveq #io_open&$FF,d0
0020' 4E42              54+         trap  #io_open/$100
0022' 4a80              54+         tst.l d0
0024' 6100 00F6         55          bne err_exit
                        56
                        57 *and save scr_ channe. id in a5
                        58
0026' 2448              59          movea.l a0,a5
                        60
                        61 *now get cartridge name and empty/good sectors
                        62
0028' 363C FFFF         63          move.w #inf,d3      timeout
002C' 284C              64          movea.l a4,a0       get dir id
002E' 43FA 0186         65          lea buffer,a1
                        66          QDOS fs_mdinf
0032' 7045              66+         moveq #fs_mdinf&$FF,d0
0034' 4E43              66+         trap  #fs_mdinf/$100
0036' 4a80              66+         tst.l d0
0038' 6600 00E0         67          bne err_exit
003C' 2801              68          move.l d1,d4        save empty/good sectrs
                        69
                        70 *print cartridge name
                        71
003E' 343C 000A         72          move.w #10,d2       10 bytes in name
0042' 284D              73          movea.l a5,a0       screen chan id
0044' 43FA 00F8         74          lea buffer,a1
                        75          QDOS io_sstrg
0048' 7007              75+         moveq #io_sstrg&$FF,d0
004A' 4E43              75+         trap  #io_sstrg/$100
004C' 4A80              75+         tst.l d0
004E' 6A00 00CA         76          bne err_exit
                        77
                        78 *print empty sector count
                        79
0052' 2204              80          move.l d4,d1
0054' 4841              81          swap d1
                        82          VECTOR ut_sint,a2
0056' 3478 00CE         82+         move.w ut_sint,a2
005A' 4E92              82+         jsr (a2)
005C' 4A80              82+         tst.l d0
005E' 6A00 00AA         83          bne err_exit
                        84
                        85 *print '/'
                        86
0062' 123C 002F         87          move.b #'/',d1
0066' 363C FFFF         88          move.w #inf,d3
                        89          QDOS io_sbyte
006A' 7005              89+         moveq #io_sbyte&$FF,d0
006C' 4E43              89+         trap  #io_sbyte/$100
006E' 4A80              89+         tst.l d0
0070' 6A00 00AA         90          bne err_exit
                        91
                        92 *print good sector count
                        93
0074' 3204              94          move.w d4,d1
                        95          VECTOR ut_sint,a2
0076' 3478 00CE         95+         move.w ut_sint,a2
007A' 4E92              95+         jsr (a2)
007C' 4A80              95+         tst.l d0
007E' 6600 009A         96          bne err_exit
                        97
                        98 *print line feed
                        99
0082' 123C 000A         00          move.b #$1f,d1
0086' 363C FFFF         01          move.w #inf,d3
                        02          QDOS io_sbyte
008A' 7005              02+         moveq #io_sbyte&$FF,d0
008C' 4E43              02+         trap  #io_sbyte/$100
008E' 4A80              02+         tst.l d0
0090' 6600 0088         03          bne err_exit
                        04
                        05 *start of loop
                        06
0094' 284C              07 loop     movea.l a4,a0       get adv_ chan id
                        08
                        09 *test for end of file
                        10
                        11          QDOS io_pend
0096' 7008              11+         moveq #io_pend&$FF,d0
0098' 4E43              11+         trap  #io_pend/$100
009A' 4A80              11+         tst.l d0
009C' 667A              12          bne.s loop_exit     exit if eof
                        13
                        14 *else fetch next dir record
                        15
009E' 7440              16          moveq #$40,d2       buffer length
00A0' 43FA 0094         17          lea buffer,a1       addr of buffer
                        18          QDOS io_fstrg
00A4' 7003              18+         moveq #io_fstrg&$FF,d0
00A6' 4E43              18+         trap  #io_fstrg/$100
00A8' 4A80              18+         tst.l d0
00AA' 6600 006E         19          bne err_exit
                        20
                        21 *test file and name length for 0
                        22
00AE' 43FA 0086         23          lea.l buffer,a1     base of buffer
00B2' 4A91              24 .        tst.l (a1)
                        25
                        26 *branch if file length 0
                        27
00B4' 670E              28          beq.s loop
00B6' 4469 000E         29          bst.w $0E(a1)
                        30
                        31 *branch if name length 0
00BA' 6708              32          beq.s loop
                        33
                        34 *:alculate sector count of file
                        35
00BC' 284D              36          movea.l a5,a0       scr_ chan id in a0
00BE' 2211              37          move.l (a1),d1      get length of file
00C0 02FC 0200          38          divu #512,d1        calc no of sectors
00C4' 4841              39          swap d.             remainder in least sig word
00C6' 4A41              40          tst.w d1            zero flg set if no remainder
00C8' 6706              41          beq.s dir_1         branch if remainder=0
00CA' 023C 0001 0000    42          add.l #$10000,d1    else incr sector count
00D0' 4841              43 dir_1    swap d.             sector count in d1.w
                        44
                        45 *print sector count
                        46
                        47          VECTOR ut_sint,a2   write sector count out
00D2' 3478 00CE         47+         move.w ut_sint,a2
00D6' 4E92              47+         jsr (a2)
00D8' 4A80              47+         tst.l d0
00DA' 6600 003E         48          bne err_exit
                        49
                        50 *tab to col 4
00DE' 323C 0004         51          move.w #4,d1
00E2' 363C FFFF         52          move.w #inf,d3      timeout
                        53          QDOS sd_tab
00E6' 7011              53+         moveq #sd_tab&$FF,d0
00E8' 4E43              53+         trap  #sd_tab/$100
00EA' 4A80              53+         tst.l d0
00EC' 6600 002C         54          bne err_exit
                        55
                        56 *print file name
00F0' 43FA 0044         57          lea buffer,a1       base of buffer back in a1
00F4' 3429 000E         58          move.w $0E(a1),d2   no of bytes in name
00F8' 02FC 0010         59          adda #$10,a1        point to start of name
                        60          QDOS io_sstrg
00FC' 7007              60+         moveq #io_sstrg&$FF,d0
00FE' 4E43              60+         trap  #io_sstrg/$100
0100' 4A80              60+         tst.l d0
0102' 6600 0016         61          bne err_exit
                        62
                        63 *print line feed
                        64
0106' 123C 000A         65          move.b #$1f,d1
                        66          QDOS io_sbyte
010A' 7005              66+         moveq #io_sbyte&$FF,d0
010C' 4E43              66+         trap  #io_sbyte/$100
010E' 4A80              67          tst.l d0
0110' 6600 FF7E         68          bne err_exit
                        69
                        70 *end loop
                        71
0114' 6000 FF7E         72          bra loop
                        73
                        74 *routine exit
                        75
0118' 4280              76 loop_exit clr.l d0           no errors
                        77
                        78 *error exit
                        79
011A' 3600              80 err_exit move.l d0,d3        err code
011C' 72FF              81          moveq #this_job,d1
                        82          QDOS rt_frjob       remove job
011E' 7005              82+         moveq #rt_frjob&$FF,d0
0120' 4E41              82+         trap  #rt_frjob/$100
0122' 4A80              82+         tst.l d0
0124' 7000              83          moveq #0,d0
0126' 4E75              84          rts                 and ret
                        85
                        86 dir_name dc.w 5
                        87          dc.b 'MDV1_'
                        88          dcb 6,2
0150'                   89 scr_name dc.w 4
0150' 0004              90          dc.b 'SCR_'
0152' 5343 525F         91          dcb 6,2
0156'                   92 buffer   ds.b $40
0156' =0040             93 buf_end
0176'                   94 buf_len  equ  buf_end-buffer
                        95
0176' =0006             96 ri_stk   ds.b $6
017C'                   97 ri_end
                        98
017C' =0010             99 ri_buf   ds.b $10
                        00
                        01          end
```

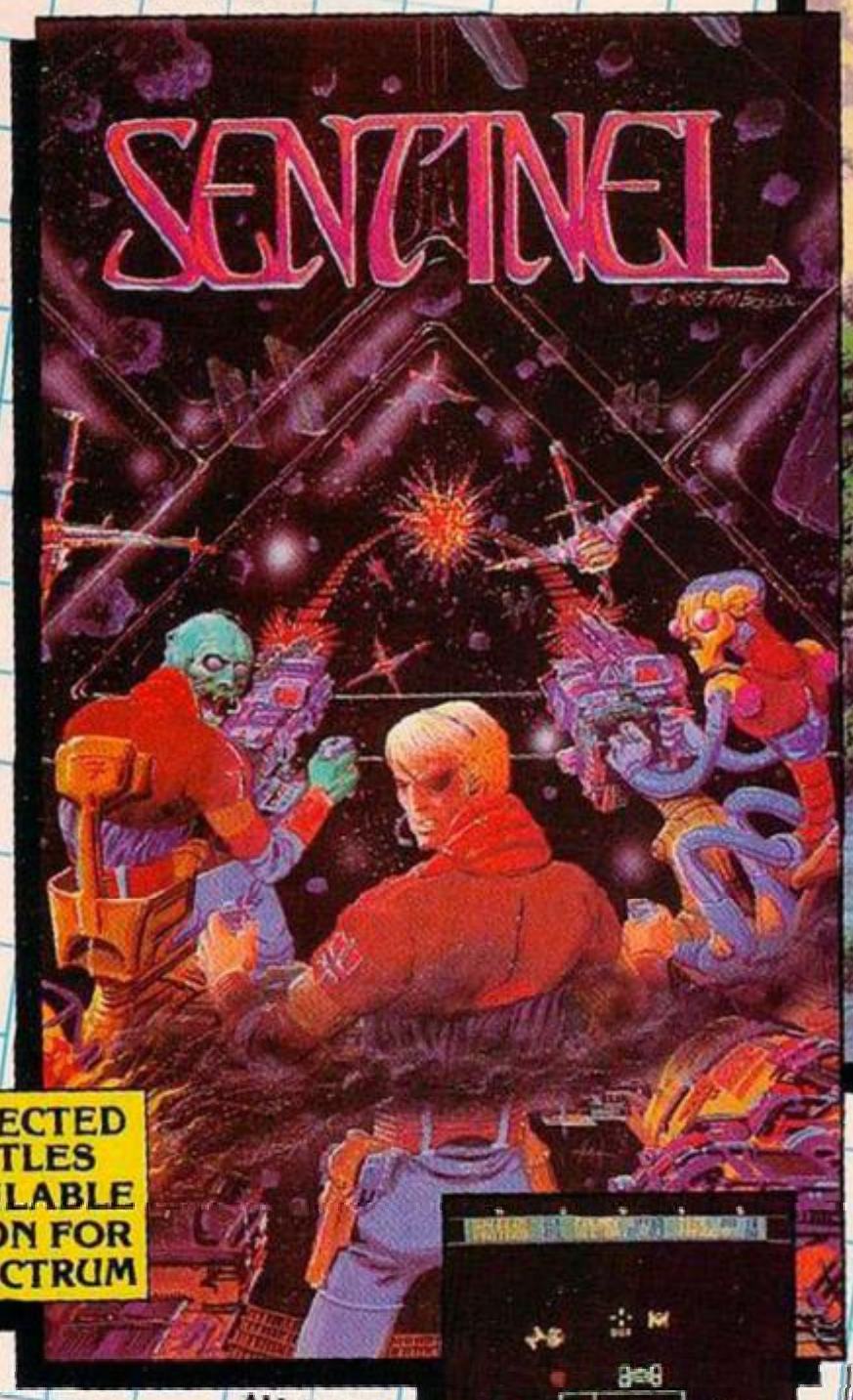
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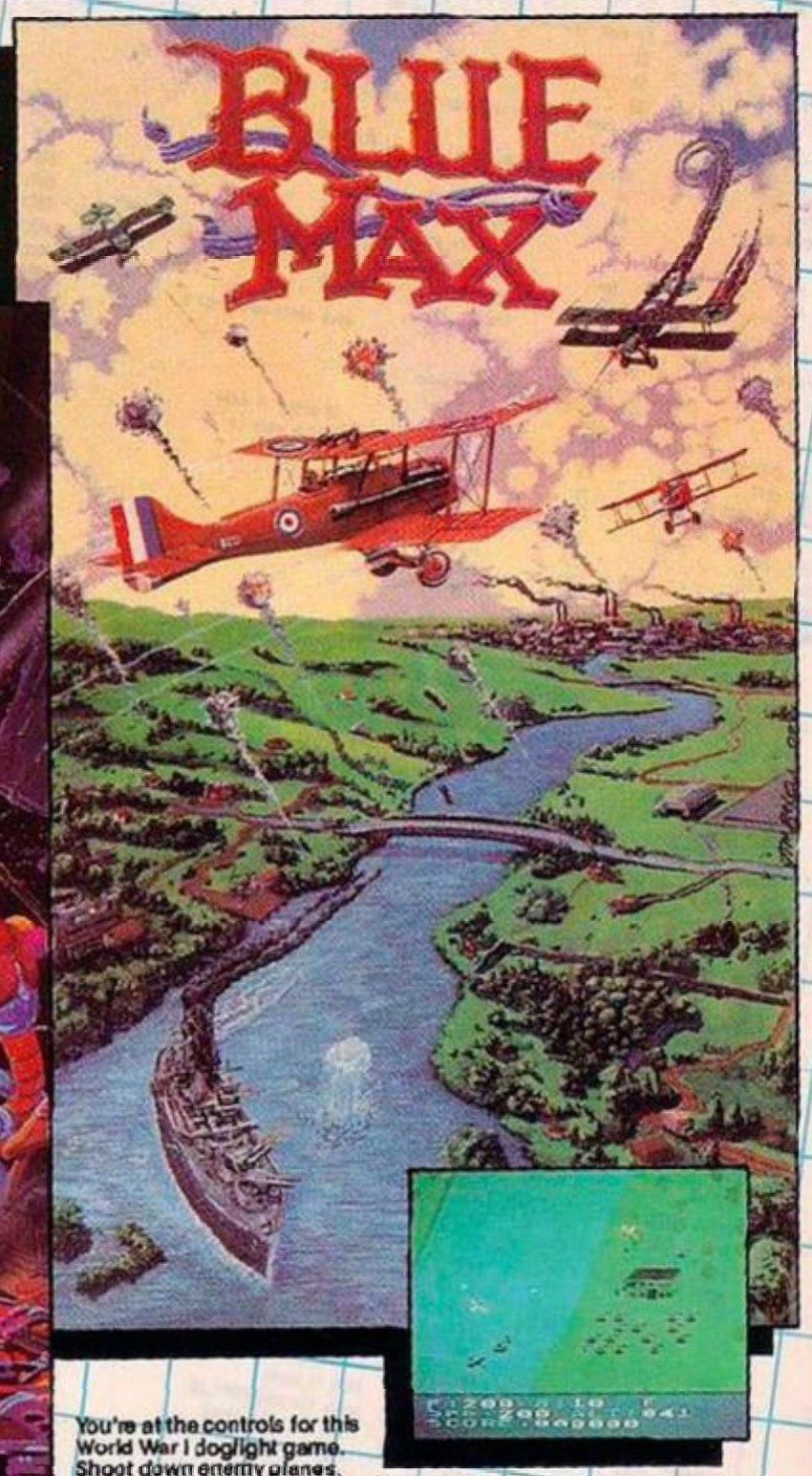
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Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

SECURITY SYSTEM

■ **I own a Vic-20 and have just finished a program which returns information to the user when a password is entered. For security, I have included a line zero in the program, to disenable the Run Stop/Restore functions. This is intended to stop a user from breaking into the program while it is running. However, when someone loads the program, Run must be typed in before the program will work. This, of course, gives the "pirate" time to list the program, and discover the password. I have heard of an automatic run sequence, such as the one on Anirog's version of *Krazy Kong*, but I cannot list the program to discover the basic idea. Please can you assist?**
Timothy Carson,
Rochdale,
Lancashire.

THERE IS NO simple Poke or whatever which will give you autorun on the Vic-20, Timothy. A machine routine to do it would be some 90 to 100 bytes long. One simple thing you could do would be to 'hide' the password within the program, so it would take a lot of diligent searching to work it out. This could be done by as follows.

Don't just have a If A$ = "Password" Then line in the program. Rather, hold the password as a series of character numbers, which the computer checks element by element, comparing the numbers with the ASCII codes of the entered string.

These need not be held in the same order as the password, and need not even be in a single place within the program. Every, say, third value could be a dummy, which the computer could ignore, and so on. If you make it difficult to work out the password, from an examination of the program, you increase its security to a certain extent.

MC GRAPHICS

■ **I have a 48K Spectrum and have been learning machine-code. Most areas of machine code are well explained in books, but I have found very little on moving graphics and sprites. Could you tell me if there are any books specifically dealing with graphics?**
Mark Goodacre,
Parklands,
Northampton.

ALTHOUGH, MARK, I do not know of any books specifically dealing with the subject, I suggest the two which are most likely to be of value to you are *Supercharge Your Spectrum* by David Webb (Melbourne House, £5.95) and *Mastering Machine Code on your Spectrum* by Tony Baker (Interface Publications, £9.95). I'd be interested to hear from any publishers who have produced works dealing specifically with this area.

QL PRINTER

■ **At present I have a ZX Spectrum, but I will be buying a QL shortly. To accompany the QL, I also intend to buy a printer. The main purpose for this is to produce a quality printout, suitable for format reports at University. However, I would also like it to be able to produce graphics. Obviously, I would need a dot matrix printer, and I gather printers such as the Brother EP44 and the Silver Reed EXD15 can produce a quality print very close to daisy-wheel quality. However, I am not sure how versatile they are with regard to graphics. Could user-define graphics be printed, for instance? If not, what kind of graphics can they print. Also, could they cope with subjects such as graphs? I intend to spend between £200 and £400.**
C J Flint,
Welwyn Garden City.

I HAVE USED an Epson FX80 extensively with my QL and have had no problem reproducing anything which can be held within a program line. Note that on the QL graphics do not have the same importance as on the Spectrum. There is no built-in Basic routine for defining your own graphics, for instance. A machine-code routine is needed for this. There is also no built-in facility, like Copy, to dump the screen to the printer, although there are routines which will do this.

I often find it is better to put something like Print CHR$ (144) within a listing, rather than just a pair of quote marks with an obscure, hard-to-decipher graphic within it. To get text output to the printer from the QL, you need to open the channel to the printer — I generally use #3 — then preface the material you want with this channel number, as in Print #3, "Hello"

If program listings and straight text output form the bulk of the work you'll be doing, almost any printer will do. You can buy a very good daisy-wheel printer within your price range. Note that some printers do *not* allow you to control the *width* of the output when listing a program, which can be a major disadvantage when including listings within other material. If this is important to you, you should check this out before you decide on a particular machine.

TOO COMPLEX?

■ **I have a program on my Commodore 64 from one of your issues which includes several machine-code routines. I am sure it is typed in correctly. When it comes to a specific line — the same line each time I try to run it — which includes SYS 38600, the program goes wrong, and the message "Formula too complex" appears on the screen. The keyboard also locks up. What is wrong?**
Bjorr Sundset,
Jakobsli,
Norway.

THE SYS CALL triggers the machine-code routine starting at address 38600. As you get an error message each time from this line, it appears that there is an error in the machine-code. The error message "Formula too complex" is not significant, as machine-code errors often trigger unrelated Basic error messages.

However, the fact that you've got a Basic error message suggests the error in your machine-code program modifies something used by the Basic program. It may, for example, take something off the stack without replacing it, so the Basic program finds the wrong values when carrying out something elsewhere in the program.

AID ON AID

■ **I own a Vic-20 and an IOIO expansion board, with a Plus 80 16K Ram, a Commodore 8K Ram, a Programmer's Aid, and a Super Expander. When I do a SYS 28681 to enable the Programmer's Aid, nothing happens. It works with the 16K Ram on its own, but when I add the other cartridges and try again, I get nothing. I would like to know if it is possible to get it to work with all the cartridges in it.**
S Moore,
Hull.

THE 8K CARTRIDGE and the Programmer's Aid use memory which overlaps, so you cannot run them both at once. You should have no problems with using all the others at the same time, but the PA and the 8K cannot be used at once because of the memory overlap.

SINCLAIR LATE!

■ **Does any reader know how to get Microdrive orders executed. I placed my order eight weeks ago, and so far have received nothing. Sinclair has not even replied to my query. I am trying to contact the Office of Fair Trading to see if they can help. Has there been any action from this body over Sinclair?**
Dr A G Smith,
Beljast.

SINCLAIR RESEARCH has been the target of several approaches from the Advertising Standards Authority, mostly due to its infamous 28 days delivery promise on QL's. A spokesman for Sinclair told me that, as far as he knew, no situation had arisen which meant the Office of Fair Trading had been brought into the question.

According to the records, your order was despatched seven weeks from the date of your order. If you have not received the product by the time the letter is published, let us know, and we'll send the boys over to sort it out.

CORRUPTION

■ **I typed in a program from an earlier issue of your magazine for the Commodore 64. I had some difficulty keying it in, due I think to there being over 80 characters in some of the lines. Eventually, I managed it, and for some time after that I played the game quite often. Then, one day, at the end of Load, "Load Error" flashed up on the screen. On listing, the program looked complete. However, the game would not run, because after typing Run, parts of some lines — and all of some other lines — were deleted, or an error message was displayed, or the machine locked up. I cannot delete nor edit the offending lines because when I press Return the listing disappears, or simply returns as it was, or the machine locks up. I have tried the tape on another Commodore 64, using another recorder, and the same result occurs. How do I play the game, without retyping the whole program.**
Fred Starr,
Cheadle Hulme,
Cheshire.

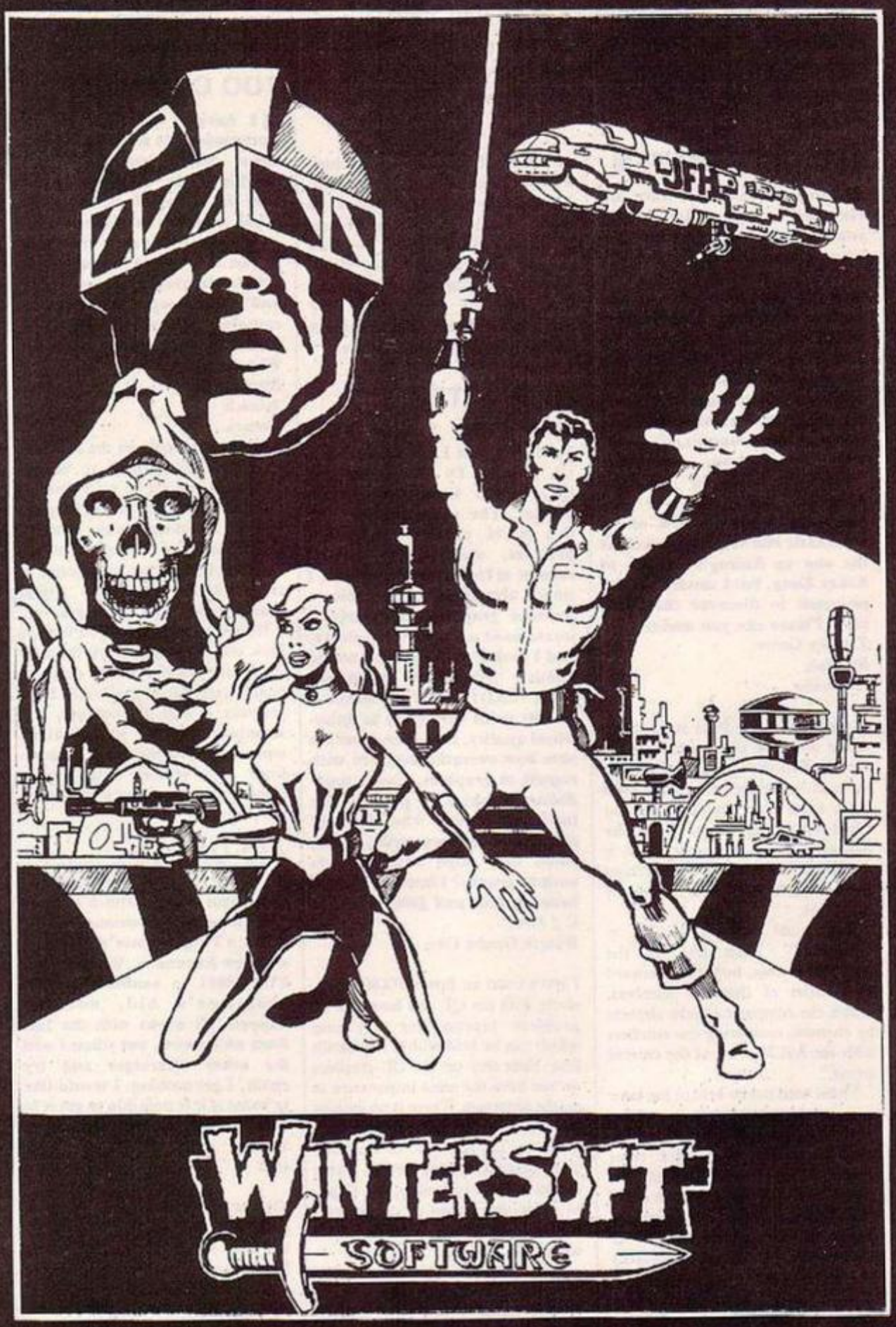
UNFORTUNATELY, IT sounds as if you have corrupted your tape, either by rerecording over part of it, destroying some of the information magnetically, or by stretching, or otherwise deforming the tape physically. Short of using the "load fix" options available in some extended Basics for the CBM-64, there is nothing you can do other than type in the program again.

I suggest that, this time, you make one or more security copies of the program, which are kept on a tape which you do not generally use, so if your working copy is corrupted, you'll have another copy of the program to fall back on.

By the way, you may have noticed on the Commodore 64 that programs which include sprites, such as the one you are talking about, tend to cause more problems when loading them in than non-sprite programs. This is because the machine slows down slightly to handle the extra interrupt routines demanded by the sprites and this appears to affect the quality of the save.

RETURN OF THE RING

THE RING OF DARKNESS PART II



At last the saga continues . . .

The Guardian of Shedir is defeated, the Hell spawned hordes of the Evil Sage lie at bay. Now Ringbearer, wielder of the Four Bright Rings, must face the greatest challenge: to return the Ring Of Darkness to its creators on the hidden planet Ringworld . . . And somewhere at the ends of time the forces of evil are preparing their revenge.

After one year of development, Wintersoft are proud to present the most sophisticated game ever created for the Dragon 32. Written 100% in machine code, RETURN OF THE RING is an astounding multi program blend of superb high resolution colour graphics and advanced routines that allow you to communicate with your computer in complete sentences. You will face challenge and excitement as you and your Ringworld companions travel a mysterious planet and brave the dangers of an amazing three-dimensional forest moon. An epic adventure unrivalled for its wealth of detail and diversity.

May luck travel your path.

Please note: RETURN OF THE RING is a complete adventure. You need not buy THE RING OF DARKNESS to play it.

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```
9950 REM    D.D.McGARR 1984
9951 INK 0: PAPER 7: BORDER 7: CLS
9952 REM LIST/LLIST START-END
9953 INPUT "FIRST LINE TO LIST ?";START
9954 INPUT "LAST LINE TO LIST ? ";END
9955 IF START = END THEN  PRINT "START AND END LINES MUST BE      DIFFERENT": CLS
 : GO TO 9952
9956 LET PROG=23635: LET VARS=23627
9957 DEF FN A(X)=256*PEEK (X+1)+PEEK X
9958 DEF FN B(X)=PEEK (X+1)+256*PEEK X
9959 LET PROG=FN A(PROG)
9960 CLS : PRINT AT 10,10;"PLEASE WAIT"
9961 LET VARS=FN A(VARS)
9962 REM FIND ADDRESS OF START              LINE
9963 LET LINEADD=PROG
9964 IF LINEADD=VARS THEN  CLS : PRINT "LINE ";START;" DOES NOT EXIST": STOP
9965 LET LINENO=FN B(LINEADD)
9966 LET LINELEN=FN A(LINEADD+2)
9967 IF  LINENO=START THEN  LET STLIN=LINENO: LET STLINEADD=LINEADD: LET STLINLE
N=LINELEN: GO TO 9971
9968 LET LINEADD=LINEADD+4+LINELEN
9969 GO TO 9964
9970 REM FIND ADDRESS OF FINISH             LINE
9971 LET LINEADD=LINEADD+4+LINELEN
9972 IF LINEADD=VARS THEN  CLS : PRINT "LINE ";END;" DOES NOT EXIST": STOP
9973 LET LINENO=FN B(LINEADD)
9974 LET LINELEN=FN A(LINEADD+2)
9975 IF  LINENO=END THEN  LET ENDLIN=LINENO: LET ENDLINEADD=LINEADD: LET ENDLINL
EN=LINELEN: GO TO 9980
9976 LET LINEADD=LINEADD+4+LINELEN
9977 GO TO 9972
9978 PRINT
9979 REM NOW PRINT LINES
9980 INPUT "LIST TO SCREEN OR PRINTER (S/P)?     ";O$
9981 CLS
9982 LET DEV=2: IF O$="P" OR O$="p" THEN  LET DEV=3
9983 REM NOW DEAL WITH PRINTING CHARACTERS , JUMPING OVER NUMBER TOKENS & UNPRIN
TABLE CHARACTERS
9984 INPUT "LINE SPACING ?                  (1=SINGLE,2=DOUBLE ETC.)    ";SP
9985 PRINT #DEV; INK 2;FN B(STLINEADD): TAB 5;
9986 FOR N=STLINEADD+4 TO ENDLINEADD+2+ENDLINLEN
9987 PRINT #DEV; INK 1;CHR$ PEEK N AND (PEEK N=13 OR PEEK N>31);
9988 IF PEEK N=14 THEN  LET N=N+5
9989 IF PEEK N=13 THEN  FOR Z=2 TO SP: PRINT #DEV: NEXT Z: PRINT #DEV; INK 2;FN
B(N+1);TAB 5;: LET N=N+4
9990 NEXT N
9991 PRINT #DEV
9992 STOP
9999 SAVE "LLIST" LINE 9950
```

List enhance

C D McGarr,
Harborne,
Birmingham.

SPECTRUM

THIS PROGRAM allows you to print a selected range of Basic lines to either screen or printer. It simulates the facility List/LList — line number to line number available on other computers.

The program will run on 16K and 48K Spectrums and is Microdrive compatible. To use it, type:

RUN 9950

The program should be Merged with an existing program, or loaded before a session. Both start and end lines should exist; a message will be printed if either is absent. A message will also be printed if the start and end lines are not different.

To alter the colour of the listed line number alter line 9985, which is red at present. To change the colour of the Basic within the line alter line 9987 — blue at present.

Qwakers

Christopher Roche,
Sutton Coldfield,
West Midlands.

CBM-64

QWAKERS is a fairground shooting game. You must shoot all the targets with a limited number of shots within the time limit. There are four levels of difficulty and four different screens.

Controls are: Z — left; X — right; space bar — fire.

To load Qwakers, type in listing 1 and, without running it, save it to tape. Then key in listing 2 — again without running it — and save it. Now rewind the tape and load as if it were a single program.

Qwakers. Listing 1.

```
10 PRINT"♥          READING MACHINE CODE"
20 FORT=0TO11:CH=0:FORS=0TO15:READA:CH=CH+A:POKE49152+T*16+S,A:NEXT:READCH
30 IFA<>(CHAND255)THENPRINT"#TYPING ERROR IN LINE"PEEK(63)+256*PEEK(64):END
40 SU=SU+CH:NEXT:IFSU<>24741THENPRINT"TYPING ERROR IN LINES 1000-1110":END
50 REM THE FOLLOWING TWO LINES WILL NEW AND LOAD THE NEXT PROGRAM ON TAPE
60 POKE631,78:POKE632,69:POKE633,87:POKE634,13:POKE635,76:POKE636,111:POKE637,13
70 POKE638,82:POKE639,117:POKE640,13:POKE198,10
80 :
90 REM******** MACHINE CODE DATA*******
100 :
110 :
120 DATA120,159,192,141,21,3,169,13,141,20,3,88,96,155,254,208,11
130 DATA4,198,2,240,3,76,49,234,173,255,3,133,2,32,35,192,95
140 DATA75,49,234,162,0,138,74,168,189,188,2,41,127,240,110,189,195
150 DATA138,2,48,51,133,252,254,0,208,208,9,173,16,208,25,164,147
160 DATA192,141,16,208,189,0,208,221,228,2,144,29,138,74,174,0,173
170 DATA173,16,208,57,164,192,240,8,189,188,2,9,128,157,188,2,129
180 DATA198,252,208,210,76,157,192,41,127,133,252,222,0,208,189,0,161
190 DATA228,201,255,208,11,173,16,208,57,172,192,141,16,208,169,255,186
200 DATA221,208,2,176,20,138,74,176,3,173,16,208,57,164,192,208,249
210 DATA48,189,188,2,41,127,157,188,2,198,252,208,208,230,224,15,190
220 DATA208,131,56,234,1,2,4,8,16,32,64,128,254,253,251,247,137
230 DATA239,223,191,127,13,13,251,255,0,3,255,255,0,0,255,255,20
```

Qwakers. Listing 2.

```
10 FORN=54272TO54296:POKEN,0:NEXT
20 POKE54296,15:LE=4000
30 POKE53269,0:RESTORE
40 POKE650,128:PRINTCHR$(8):POKE254,1
50 GOSUB770:REM TITLE PAGE
60 GOSUB1310:REM MUSIC  FOR TITLE PAGE
70 GOTO940:REM PICK SKILL LEVEL
80 GOSUB620:REM DRAW BOX FOR DUCKS
90 V=53248:OC=1
100 POKE2040,192:POKE2041,193:POKE2042,194:POKE2043,195:POKE2044,196:POKE2045,19
7
110 POKE2046,198:POKE2046,198:POKE2047,199
120 POKEV+39,2:POKEV+39,2:POKEV+40,5:POKEV+41,8:POKEV+42,6:POKEV+43,9:POKEV+44,3
130 POKEV+46,1:POKEV+45,4
140 FORN=0TO62:READQ:POKE12288+N,Q:NEXT
150 FORN=0TO62:READQ:POKE12352+N,Q:NEXT
160 FORN=0TO62:READQ:POKE12416+N,Q:NEXT
170 FORN=0TO62:READQ:POKE12480+N,Q:NEXT
180 FORN=0TO62:READQ:POKE12544+N,Q:NEXT
190 FORN=0TO62:READQ:POKE12608+N,Q:NEXT
200 FORN=0TO62:READQ:POKE12672+N,Q:NEXT
210 FORN=0TO62:READQ:POKE12736+N,Q:NEXT
220 POKEV+1,116
230 POKEV+3,116
240 POKEV+5,116
250 POKEV+7,116
260 POKEV+9,116
270 POKEV+13,116
280 POKEV+11,210
290 SYS49152
300 POKE254,1
310 POKE1023,2:POKE2,2
320 POKE700,2:POKE701,0:POKE702,2:POKE703,0:POKE704,2:POKE705,0:POKE706,2
330 POKE707,0:POKE708,2:POKE709,0
340 POKE713,0:POKE712,2
350 FORA=720TO729:B=0
360 POKEA,B:NEXT
370 FORA=740TO749:B=0
380 POKEA,B:NEXT:TI$="000000"
390 POKEV,21:POKEV+2,65:POKEV+4,105:POKEV+6,145:POKEV+8,185:POKEV+12,222
400 REM**********************************
410 REM*          MAIN LOOP             *
420 REM**********************************
430 POKEV+21,255:POKE254,0:SH=10
440 PRINT"♥■■■■■■■■PLEASE WAIT FOR DUCKS"
450 PRINT"■■■■■■■■  MOVE INTO POSITION  ":FORSD=1TO3000:NEXT
460 PRINT"■■■■■■■■                       "
470 PRINT"■■■■■■■■                       "
480 REM MOVE GUN
490 GETA$:XX=0
500 IFA$="Z"THENXX=-5
510 IFA$="X"THENXX=+5
520 IFA$=" "THENGOTO1530
530 C=C+XX:IFC>240THENC=240
540 IFC<35THENC=35
550 POKEV+10,C
560 PRINT"■":PRINTSPC(33)"■■■■■■      ■■■■■■TIME ■■■■■■■";TI$
570 PRINT"■■■■■■■■■■■■SHOTS■■■■■■■■";SH;"■ "
580 GOTO490
590 REM**********************************
600 REM*          DRAW BOX              *
610 REM**********************************
620 POKE 53280,0:POKE53281,0:PRINTCHR$(147)
630 PRINTTAB(32)"■■■"
640 FORA=1TO7:PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■   ":NEXTA
650 PRINTTAB(33)"
660 PRINT"■■■■■                                    ■■"
670 PRINT"■■■                                      ■■"
680 PRINT"■■"
690 PRINT"■■ ::  ▌                                 ::  ■■ "
700 PRINT"■■ ::  ▌          QWAKERS                ::  ■■ "
710 PRINT"■■ ::  ▌                                 ::  ■■ "
720 PRINT"■■ :: ■■■────────────────────────────────■■ ■■ "
730 PRINT"■■ ■■■∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿■■■ "
740 PRINT"■■
750 RETURN
760 REM**********************************
770 REM*         TITLE SCREEN           *
780 REM**********************************
790 POKE53280,7:POKE53281,3:PRINTCHR$(147)
800 PRINT
```

(continued on next page)

(continued from previous page)

```
10 PRINT"
20 PRINT"
30 PRINT"
40 PRINT"
50 PRINT"
60 PRINT"
70 PRINT"
80 PRINT"
90 PRINT PRINTSPC(13)"BY CHRIS ROCHE"
900 RETURN
910 REM**********************************
920 REM*       PICK SKILL LEVEL          *
930 REM**********************************
940 POKE50200,0:PRINT"
950 PRINT"  PRIN
960 PRINTTAB(10)    "
970 PRINTTAB(10)    "
980 PRINT"  INNOCENT
990 PRINTTAB(10)    "
1000 PRINTTAB(10)   "
1010 PRINTTAB(10)   "
1020 PRINTTAB(10)   "
1030 PRINT"  ROOFER
1040 PRINTTAB(10)   "                    PLEASE ENTER YOUR"
1050 PRINTTAB(10)   "
1060 PRINTTAB(10)   "                    LEVEL OF SKILL"
1070 PRINTTAB(10)   "
1080 PRINT"  DAREDEVIL
1090 PRINTTAB(10)   "
1100 PRINTTAB(10)   "
1110 PRINTTAB(10)   "
1120 PRINTTAB(10)   "
1130 PRINT"  CRAZY
1140 PRINTTAB(10)   "
1150 PRINTTAB(10)   "
1160 GOTO1220
1170 Z=2:GOTO80
1180 Z=3:GOTO80
1190 Z=4:GOTO80
1200 Z=5:GOTO80
1210 L=PEEK(157)
1220 ON L GOSUB1240,1250,1260,1270
1230 IFN=1THENN=1:GOTO1280
1240 IFN=2THENN=2:GOTO1280
1250 IFN=3THENN=3:GOTO1280
1260 IFN=4THENN=4
1270 PRINT"
1280 ON N GOTO1170,1180,1190,1200
1290 REM**********************************
1300 REM*   MUSIC FOR TITLE PAGE        *
1310 REM**********************************
1320 S=54272
1330 FORL=0TO24:POKES+L,0:NEXT
1340 POKES+3,8
1350 POKES+5,41:POKES+6,89
1360 POKES+14,177
1370 POKES+18,16
1380 POKES+24,143
1390 READFR,IF
1400 IFFR=0THENGOTO940
1410 POKES+4,65
1420 FORT=1TO1ORM*2
1430 FQ=FR+PEEK(S+27)/2
1440 HF=INT(FQ/256):LF=FQ-HF*256
1450 POKES+0,LF:POKES+1,HF
1460 NEXT
1470 POKES+4,64
1480 GOTO1390
1490 RETURN
1500 REM**********************************
1510 REM* FIRE BULLET AND MAKE SOUND    *
1520 REM**********************************
1530 POKE54277,25
1540 POKE54276,129
1550 POKE54273,20
1560 POKE54276,135
1570 FORN=1TO1STEP2
1580 POKE54273,N:NEXT
1590 POKE54276,128
1600 POKEV+46,1:POKEV+14,C:FORA=200TO124STEP-1.2:POKEV+1F,A:NEXT
1610 POKEV+30,1:POKEV+21,..28+PEEK(V+21)AND(127-PEEK(V+30)+128)
1620 POKEV+30,1:POKEV+21,PEEK(V+21)AND(127-PEEK(V+30))+128
1630 POKEV+21,128+PEEK(V+21)AND(127-PEEK(V+30)+128):POKEV+46,0
1640 IFFRE(0)<5269THENGOSUB60:C=C+1:GOTO1475
1650 SH=SH+1:IFSH=9THENGOTO2210
1660 POKE198,0:GOTO530
1670 IFOC=2THEN1730
1680 IFOC=3THEN1850
1690 IFOC=4THEN2060
1700 IFOC=5THENZ=Z+2:GOTO730
1710 IFOC=6THEN1850
1720 IFOC=7THEN2060
1730 REM**********************************
1740 REM*       LEVEL TWO                *
1750 REM**********************************
1760 PRINT"BONUS OF 3 SHOTS"
1770 FORI=0TO62:READD:POKE12288+I,D:NEXT
1780 FORI=ATN(0):READD:POKE12352+I,D:NEXT
1790 POKEV+21,163
1800 S=SH*2
1810 POKE720,30:POKE721,95:POKE740,0:POKE741,128:POKE701,Z:REM SPRITE ONE
1820 POKE722,30:POKE723,95:POKE742,0:POKE743,128:POKE703,Z+2:REM SPRITE TWO
1830 PRINT"
1840 GOTO530
1850 REM**********************************
1860 REM*       LEVEL THREE              *
1870 REM**********************************
1880 PRINT"BONUS OF 3 SHOTS"
1890 FORI=0TO62:READD:POKE12288+I,D:NEXT
1900 FORI=0TO62:READD:POKE12352+I,D:NEXT
1910 FORI=0TO62:READD:POKE12416+I,D:NEXT
1920 FORI=0TO62:READD:POKE12480+I,D:NEXT
1930 FORI=0TO62:READD:POKE12544+I,D:NEXT
1940 FORI=0TO62:READD:POKE12672+I,D:NEXT
1950 POKEV+21,175
1960 SH=SH+5
1970 PRINT"
1980 POKE720,0:POKE721,95:POKE740,0:POKE741,128:POKE701,Z+2:POKE700,(
1990 POKE722,0:POKE723,95:POKE742,0:POKE743,128:POKE703,Z:POKE702,0
2000 POKE724,0:POKE725,95:POKE744,0:POKE745,128:POKE705,Z-1:POKE704,(
2010 POKE726,0:POKE727,95:POKE746,0:POKE747,128:POKE707,Z+3:POKE706,(
2020 POKEV+0,62:POKEV+3,110:POKEV+1,160:POKEV+6,210
2030 POKEV+39,3:POKEV+40,5:POKEV+41,7:POKEV+42,13
2040 PRINT"
2050 GOTO530
2060 REM**********************************
2070 REM*       LEVEL FOUR               *
2080 REM**********************************
2090 PRINT"BONUS OF 3 SHOTS"
2100 POKE720,0:POKE721,95:POKE740,0:POKE741,128:POKE701,Z
2110 POKE722,0:POKE723,95:POKE742,0:POKE743,128:POKE703,Z:POKE702,Z
2120 POKE724,0:POKE725,95:POKE744,0:POKE745,128:POKE705,Z:POKE704,Z
2130 POKE726,0:POKE727,95:POKE746,0:POKE747,128:POKE707,Z:POKE706,Z
2140 POKE726,0:POKE727,95:POKE746,0:POKE747,128:POKE737,Z:POKE706,Z
2150 POKE732,0:POKE733,95:POKE752,0:POKE753,128:POKE713,Z:POKE712,Z
2160 POKEV-8,38:POKEV+3,70:POKEV+6,110:POKEV+1,150:POKEV+9,190:POKEV+12,230
2170 POKEV-39,2:POKEV+40,5:POKEV+41,7:POKEV+42,13
2180 PRINT"
2190 POKEV-21,255
2200 FORQ=1TO800:NEXT:GOTO530
2210 REM**********************************
2220 REM*       GAME OVER                *
2230 REM**********************************
2240 PRINT"
2250 PRINTAB(7)"
2260 PRINTAB(7)"
2270 PRINTAB(7)"
2280 REM  GAME OVER
2290 POKE198,0
2300 PRINT"
2310 PRINT"
2320 FORA=1TO50:NEXT
2330 C$=RIGHT$(A$,14)+LEFT$(A$,1)
2340 A$=C$
2350 PRINTTAB(8);A$
2360 GET$:IFB$<>"Y"ANDB$<>"N"THENG2310
2370 IFB$="Y"THENRUN
2380 SYS64738
2390 REM***==INTA FOR TITLE MUSIC==***
2400 DATA4817,2,5169,2,5407,2
2410 DATA8502,4,5407,2,8583,4
2420 DATA9407,4,8583,12,9634,2
2430 DATA10207,2,10814,2,8583,2
2440 DATA9634,4,10814,2,8583,2
2450 DATA9634,4,8583,12,0,3
2460 REM
2470 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,2,7,128,6,9,192,0,127,159,135,127,255,222
2480 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255,192,3,255,192
2490 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2500 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,2,7,128,6,9,192,0,127,159,135,127,255,222
2510 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255 192,3,255,192
2520 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2530 REM
2540 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,2,7,128,6,9,192,0,127,159,135,127,255,222
2550 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255 192,3,255,192
2560 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2570 REM
2580 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,7,128,6,9,192,0,127,159,135,127,255,222
2590 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255,192,3,255,192
2600 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2610 REM
2620 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255 192,3,255,192
2630 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2640 REM
2650 DATA0,15,192,0,30,192,0,6,,192,0,120,192,0,247,128,1,239,0,1 239 0,3,222
2660 DATA0,7,188,0,15,120,0,8,248,3,16,232,0,16,200,0,16,208,0,16 224 0,16
2670 DATA192,0,16,192,0,16 192 0,16,192,0,16,192,0,21,128,0
2680 REM
2690 DATA0,0,0,0,0,0,0,0 0,0,0,0,3,0,0,7,128,0,9,192,0,127,159,135,127,255,222
2700 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255 192,3,255,192
2710 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2720 REM
2730 DATA0,0,0,0,0,0,0,0,0 0,0,0,0,0,0,0,1,128,0,1,128,0,1,128,0,0,0,0,0,0
2740 DATA0,0,0,0,0,0,0,0,0,0 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2750 REM
2760 DATA  0,0,0,0,0,0,0,0,0,127,0,1,255,192,3,255,224,7,255,240,,5,255,248
2770 DATA31,255,240,31,255,248,31,255,240,31,255,248,15,255,240,15,255
2780 DATA240,7,255,224,3,255,192,1,255,128,0,126,0,0,0,0,0,0,0,0,0,0,0
2790 REM
2800 DATA  0,0,0,0,0,0,0,0,0,127,0,1,255,192,3,255,224,7,255,240,,5,255,248
2810 DATA31,255,240,31,255,248,31,255,248,31,255,248,15,255,240,15,255
2820 DATA240,7,255,224,3,255,192,1,255,128,0,126,0,0,0,0,0,0,0,0,0,0,0
2830 REM
2840 DATA0,0,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192 7
2850 DATA255,192,1,199,0,0,124,0,0 108,,0,108,3,0,108,0,3,239,128,0,0,0,0 0
2860 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2870 REM
2880 DATA0,0,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192 7
2890 DATA255,192,1,199,0,0,124,0,0 108,,0,108,3,0,108,0,3,239,128,0,0,0,0,0
2900 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2910 REM
2920 DATA0,0,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192 7
2930 DATA255,192,1,199,0,0,124,0,0 108,,0,108,3,0,108,0,3,239,128,0,0,0,0,0
2940 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2950 REM
2960 DATA0,0,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192 7
2970 DATA255,192,1,199,0,0,124,0,0 108,,0,108,3,0,108,0,3,239,128,0,0,0,0,0
2980 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2990 REM
3000 DATA0,0,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192 7
3010 DATA255,192,1,199,0,0,124,0,0 108,,0,108,3,0,108,0,3,239,128,0,0,0,0,0
3020 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3030 REM
3040 DATA0,0,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192 7
3050 DATA255,192,1,199,0,0,124,0,0 108,,0,108,3,0,108,0,3,239,128,0,0,0,0,0
3060 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
```

Submarine

S Edwardes,
London SE19.

AMSTRAD

THE PROGRAM is an adaptation of an old arcade game in which the player — in a submarine — has to sink as many ships as possible in the time allowed while avoiding the mines dropped by the ships.

The program aims to show some of the very advanced features of the Amstrad and has been documented, within the program, in order that general principles can be seen and to allow for improvements or modifications.

The program uses the very versatile interrupt commands together with the extensive sound possibilities of this machine including multi-channel tunes and special sound effects, e.g. a "whoosh" as the torpedo is fired, explosions etc., and a fairly regular sonar bleep which is also interrupt driven.

The game is written for use with a Quickshot II Joystick but could easily be acapted for keyboard control by altering lines 210-230. All rem lines — starting with either Rem or ' — may be removed but are useful for seeing how the program is built up.

Rules are not included in the program but are very straightforward. The object of the game is to sink as many ships as possible within the given time. To do this you move the cursor left or right in order to line it up with the finishing point of each torpedo. The torpedos start from the nose of the sub which remains bottom centre of screen.

When the first button is pressed a simple trig formula moves the torpedo gradually to the position of the cursor and hopefully hits a ship.

SOFTWARE FILE

For each ship hit you score 50 points. The ships drop mines at random which home-in on the sub. These may be stopped by a direct hit from a torpedo or may very occasionally stop of their own free will in which case a torpedo fired at them will have been a waste of time. If a mine hits the sub, you lose a life.

If you lose five lives the game ends. Lastly, right at the beginning you are asked to input the level of difficulty. This figure sets the speed at which the Every command is called and so affects the speed of the ships across the screen.

Program notes and main variables.

Lines:

15-90	Set level of difficulty.
100	Sets up main variables — see below.
110	Jumps to initial screen, array for note frequency and duration, and plays tune.
130	Useful when typing in program. Defines small Enter key to list in black on white.
150	Sets up more variables.
160	Jumps to main screen, windows, volume and tone envelopes and UDG definitions.
170-180	Interrupt commands.
190-670	Main loop.
680-1010	Interrupt routine to move ship. Also random mine generation; test for mine-hit etc.
1020-1360	Main screen, windows etc.
1390-1750	Primary screen, music etc.
1750-2270	End of game routines.

Variables.

tim = amount of time allowed. Initially 100 — about 2½ mins.

Lev = speed of interrupt routine — 1 to 5.

```
10 '************ c.  S.EDWARDES 1984 **************
15 MODE 0:INK 0,1:INK 1,26
20 LOCATE 1,9
30 PRINT"PLEASE ENTER LEVEL:-                    (1=H
ARD: 5=EASY)"
40 LOCATE 1,20
50 INPUT lev
60 IF lev<1 OR lev>5 THEN GOTO 70 ELSE GOTO 100
70 CLS:LOCATE 6,12:PRINT"TRY AGAIN":CHR$(7)
80 FOR n=1 TO 1500:NEXT n
90 RUN
100 sc=0:tim=100:l=5
110 GOSUB 1420
120 MODE 1
130 KEY 139,"mode 2:border 13:ink 0,13:ink 1,0:paper 0
:pen 1:list"+CHR$(13)
150 x=1:xs=10:ox=320:oy=28:ymine=272:fired=0:mine=0
160 GOSUB 1050:        REM              ****** SET UP SCR
EEN ETC ******
170 EVERY lev+10,3 GOSUB 690
180 EVERY 75,2 GOSUB 970
190 DI:                REM              ****** AVOIDS COR
UPTING SCREEN ******
200                    REM          ****** MOVE SIGHTS & C
HECK FOR VALID FIRE ******
210 xs=xs-(JOY(0)=8)+(JOY(0)=4)
220 IF JOY(0)>=16 AND fired=0 THEN GOSUB 1320:fired=1
230 IF JOY(0)<16 AND fired=0 THEN GOTO 610
240 oy=oy+16
250 px=295-(oy-16)*((ox-xs2)/272)
260 PLOT px,oy
270 TAG
280 PRINT" ";CHR$(231);' ";
290 TAGOFF
300 REM                        ****** MINE HIT ******
310 IF px>=xmine+8 OR px<=xmine-8 AND oy>=ymine+8 OR o
y<=ymine-8 THEN GOTO 400
320 TAG
330 MOVE px,oy
340 PRINT"    ";
350 MOVE px,oy-16
360 PRINT"    ";
370 TAGOFF
380 fired=0:oy=28
390 ymine=272
400 IF oy<255 THEN GOTO 530
410 '
420 '
430 '
440 REM                        ******* SHIP HIT ******
450 '
460 '
470 IF px>=(x-4)*16 AND px<=(x+2)*16 THEN SOUND 1,500,
165,6,2,1,15:FOR n=1 TO 50:LOCATE x,9:PRINT shiphit$:N
EXT n:LOCATE x,9:PRINT"    ":x=1:sc=sc+50:PRINT#1,"SCO
RE=";sc;
480 '
490 '
500 REM                        ****** TORPEDO OFF SCREEN ****
**
510 '
520 '
530 IF oy>=265 THEN LOCATE (INT(px/16))+2,25-(INT(oy/1
6)):PRINT"  ":LOCATE(INT(px/16))+1,26-(INT(oy/16)):PRI
NT'    ":fired=0:oy=28:LOCATE 20,25:PRINT CHR$(204);CH
R$(205);
540 px=295-(oy-16)*((ox-xs2)/272)
550 oy2=oy-16
560 MOVE px-32,oy2
570 TAG
580 PRINT"     ";
590 TAGOFF
600 LOCATE 20,25:PRINT CHR$(204);CHR$(205);
610 IF xs<1 THEN xs=1
620 IF xs>38 THEN xs=38
630 LOCATE xs,10
640 PAPER 0
650 PRINT" ";CHR$(244);" "
660 EI
670 GOTO 190
680                    REM              ****** SHIP MOVE ROUT
INE ******
690 LOCATE x,9
700 PRINT" ";CHR$(240);CHR$(241);CHR$(242);CHR$(243)
710 IF ymine=272 THEN GOSUB 1350
720 IF ymine<272 THEN GOTO 730 ELSE IF INT(RND*10)+1<>
1 THEN GOTO 940
730 ymine=ymine-6
740 xmine=300-((320-xm2)/240)*(ymine-32)
750 IF ymine>25 THEN GOTO 870
760 SOUND 1,200,100,7,0,0,10
770 FOR n=1 TO 10
780 LOCATE 19,25:PRINT sub$
790 LOCATE 20,25:PRINT sub$
800 LOCATE 21,25:PRINT sub$
810 LOCATE 20,25:PRINT sub$
820 LOCATE 19,25:PRINT sub$
830 NEXT n
840 l=l-1:PRINT#3,"LIVES";l
850 IF l=0 THEN GOTO 1790
860 ymine=272:GOTO 940
870 MOVE xmine,ymine
880 TAG
890 PRINT' * ";
900 IF ymine>=257 THEN GOTO 930
910 MOVE xmine,ymine+16
920 PRINT"    ";
930 TAGOFF
940 x=x+1
950 IF x=36 THEN LOCATE 36,9:PRINT"    ":x=1
960 RETURN
970 SOUND 1,55,75,8,3,2,0
980 tim=tim-1
990 PRINT #2,"TIME=";tim
1000 IF tim=0 THEN GOTO 2020
1010 RETURN
1020                   REM              ****** VOL. & TONE EN
VELOPES : INK COLOURS SET :
                                        SCREEN & WINDOWS DRAWN
: U.D.G'S DEFINED ******
1030 '
1040 '
1050 ENV 1,5,3,1,1,0,10,30,-1,10
1060 ENV 2,11,-1,25
1070 ENV 3,15,-1,5
1080 ENT 1,9,49,5,9,-10,15
1090 ENT 2,2,2,3,2,-2,3
1100 BORDER 0
1110 INK 0,1:INK 1,26:INK 2,11:INK 3,6
1120 FOR n=2 TO 8
1130 LOCATE 1,n
1140 PAPER 2
1150 PRINT"                                              "
1160 NEXT n
1170 WINDOW #1,1,11,1,1:PAPER #1,3
1180 WINDOW #2,15,24,1,1:PAPER #2,3
1190 WINDOW #3,31,40,1,1:PAPER #3,3
1200 PRINT#1,"SCORE=";sc:PRINT #2,"TIME=";tim:PRINT #3
,"LIVES=";l
1210 SYMBOL 240,0,0,0,31,4,255,127,63
1220 SYMBOL 241,2,2,15,63,63,255,255,255
1230 SYMBOL 242,0,0,192,255,255,255,255,255
1240 SYMBOL 243,0,0,0,240,254,252,248,240
1250 SYMBOL 245,0,0,86,170,0,0,0,0
1260 SYMBOL 246,17,59,58,30,31,15,7,3
1270 SYMBOL 247,128,65,2,4,8,16,255,255
1280 SYMBOL 248,68,76,30,60,120,240,224,192
1290 shiphit$=CHR$(246)+CHR$(247)+CHR$(248)+" "
1300 sub$=" "+CHR$(204)+CHR$(205)+" "
1310 RETURN
1320 xs2=(xs*16)
```

(continued on next page)

(continued from previous page)

```
1330 SOUND 1,200,90,15,1,0,9
1340 RETURN
1350 xm2=(x*16)
1360 RETURN
1370 '
1380 '
1390 REM                    ***** MUSIC *****
1400 '
1410 '
1420 MODE 0
1430 BORDER 11,16
1440 LOCATE 7,6:PRINT"   YOU HAVE APPROX.   "
1450 PRINT
1460 LOCATE 5,10:PRINT;(tim*1.5);'SECONDS'
1470 PRINT
1480 PRINT
1490 PRINT"    TO SINK THE    "
1500 PRINT
1510 PRINT
1520 PRINT"       CONVOY       "
1530 DIM notes1(25)
1540 DIM notes2(25)
1550 DIM dur1(25)
1560 DIM dur2(25)
1570 FOR a=1 TO 25
1580 READ notes1(a)
1590 READ dur1(a)
1600 NEXT a
1610 FOR a=1 TO 25
1620 READ notes2(a)
1630 READ dur2(a)
1640 NEXT a
1650 DATA 379,50,0,2,379,23,358,25,0,2,358,23,0,25,379
,25,358,25,379,25,426,25,478,25,506,75,426,25,319,50,3
5A,50,379,12.5,478,12.5,358,12.5,426,12.5,319,25,358,2
5,379,50,426,50,478,75
1660  DATA 638,75,478,25,0,2,478,23,0,2,478,23,0,25,47
8,25,568,25,478,25,568,25,479,25,426,75,50A,25,478,50,
506,50,638,12.5,758,12.5,506,12.5,638,12.5,478,25,568,
25,478,50,638,50,758,75
1670 FOR a=1 TO 25
1680 SOUND 17,notes1(a),dur1(a)
1690 SOUND 18,notes2(a),dur2(a)
1700 NEXT a
1710 RETURN
1720 '
1730 '
1740 '
1750 REM                    ***** END OF GAME ROUTINES ****
*
1760 '
1770 '
1780 '
1790 FOR n=1 TO 3000:NEXT n:MODE 0
1800 LOCATE 18,26:PRINT"      BAD LUCK       "
1810 PRINT
1820 PRINT" YOU WERE DESTROYED "
1830 PRINT
1840 PRINT"      BY MINES       "
1850 PRINT
1860 PRINT"  BUT YOU SCORED  "
1870 PRINT
1880 PRINT
1890 PRINT"       ";sc
1900 PRINT
1910 PRINT
1920 PRINT"       POINTS       "
1930 PRINT
1940 PRINT
1950 PRINT"  WANT ANOTHER GO  "
1960 PRINT
1970 PRINT
1980 GOSUB 2190
1990 STOP
2000 '
2010 '
2020 DI:MODE 0
2030 LOCATE 18,5:PRINT" YOUR TIME RAN OUT "
2040 PRINT
2050 PRINT
2060 PRINT"  BUT YOU SCORED  "
2070 PRINT
2080 LOCATE 8,14:PRINT;sc
2090 PRINT
2100 PRINT
2110 PRINT"       POINTS       "
2120 PRINT
2130 PRINT
2140 PRINT"  WANT ANOTHER GO  "
2150 PRINT
2160 PRINT"       (y/n)       "
2170 GOSUB 2190
2180 STOP
2190 a$=INKEY$:IF a$="" THEN GOTO 2190
2200 IF a$="y" THEN RUN ELSE IF a$="n" THEN RETURN
2210 GOTO 2190
```

The Mine

F Clancy,
Manchester.

ZX-81

FULL INSTRUCTIONS on playing The Mine are included in the program. To save a copy of The Mine, first type in on line 1 a Rem statement containing at least 670 characters. Next type in the standard hex loader given. Then run this program and type in the hex code given in listing 2. Then delete the hex loader, leaving line 1 intact.

Finally enter the rest of the Basic program given in listing 3 and save the finished program by entering Goto 770.

Listing 1. The hex loader.

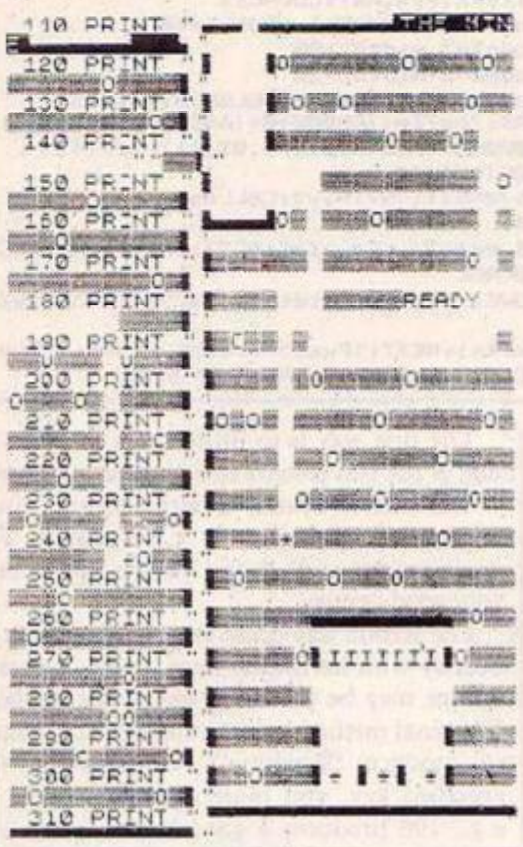
```
  99 REM HEX LOADER
 100 PRINT "START ADDRESS"
 110 INPUT S
 120 PRINT "FINISH ADDRESS"
 130 INPUT F
 140 FOR N=S TO F STEP 8
 150 LET T=0
 160 PRINT N;" - ";
 170 INPUT A$
 180 PRINT A$;" - ";
 190 INPUT TOT
 200 PRINT TOT
 210 LET Z=0
 220 FOR K=1 TO LEN A$ STEP 2
 230 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
 240 LET T=T+C
 250 POKE N+Z,C
 260 LET Z=Z+1
 270 NEXT K
 280 IF TOT=T THEN GOTO 310
 290 PRINT "ERROR - PLEASE INPUT
 AGAIN"
 300 GOTO 150
 310 NEXT N
```

Listing 2.

```
16519 - 2A0C4011880019220C - 330
16527 - FE7F11880019220CC7 - 752
16535 - 7F3E0032F27F32C37F - 853
16543 - 7F2A0C4011880019   - 376
16551 - 220C47F3EFA32C67F  - 1044
16559 - 21000022C77F2AFE   - 659
16567 - 7F3F2640FEDF2006   - 804
16575 - 3A2540FEF720012B   - 736
16583 - 3A2540FEEF20173A   - 765
16591 - 2640FEF720012311   - 688
16599 - 2100FEEF2003A7ED   - 986
16607 - 52FEDF20011922FA   - 901
16615 - 7F7EFE202819FE88   - 962
16623 - 2815FE1720080605   - 392
16631 - 21F27F34CDED4E10   - 984
16639 - 062AFE7F22FA7F2A   - 882
16647 - FE7F36002AFA7F36   - 908
16655 - 1522FE7F3EB41121   - 728
16663 - 002A0A7FA7ED52BE   - 1047
16671 - 204A19E5A7ED52BE   - 1038
16679 - 202A360012363 4A7  - 354
16687 - ED5218F0E1E53AFE   - 1049
16695 - 7F5D2015 3AFF7FBC  - 958
16703 - 20101922FE7F7EFE   - 868
16711 - 002805E122FE7FC9   - 886
16719 - 3615E1197EFE0028   - 745
16727 - 05FE152802180D3E   - 422
16735 - 66064610FE30FE34   - 815
16743 - 20F718B73E341121   - 650
16751 - 002AFF7FF5A7ED52   - 1138
16759 - BE2004CBFE18F6E1   - 1178
16767 - 22CA7F2AFE7F1121   - 836
16775 - 00A7ED523E03BE20   - 773
16783 - 123AF27FFE05200B   - 747
16791 - 19366021C67F46CD   - 712
16799 - EB42C9ED5B0C402A   - 948
16807 - FE7FF7ED52112100   - 917
16815 - 3EFFED5D3030F8FE   - 1249
16823 - 143828197DFE0938   - 585
16831 - 22FE10301E2AC77F   - 750
16839 - 3E2EEE28163A3440   - 534
16847 - 1CF7DC841C30F5ED   - 1099
16855 - 4B0C402178020919   - 343
16863 - 22077F2AC77F7EFE   - 1108
16871 - 2E2017112100C3600  - 205
16879 - 197EFE152803362E   - 561
16887 - 29FE0020053E2E22   - 626
16895 - C77F0121002ACC7F   - 793
16903 - E5ED5B0C402A7ED52  - 1119
16911 - 3EFF30A7ED4230FA   - 1145
16919 - 29452AFE7FA7ED52   - 987
16927 - 3805001EFF14A7ED   - 795
16935 - 4230FA0E454FE17B   - 669
16943 - B83801E53DB83001   - 578
16951 - 237EFE02202AFE15   - 770
16959 - 28174ACC7F798A11   - 750
16967 - 2100F520011 9F108  - 649
16975 - 03A7ED527EFE1560   - 922
16983 - 0838052ACC7F3600   - 800
16991 - C9FE0028032ACC7F   - 871
16999 - E52ACC7F3600E126   - 939
17007 - 052ACC7F3A037F3E   - 994
17015 - 0132037FFED00547   - 708
17023 - 21C37F7E35FE00C8   - 991
17031 - D60F280430FA1837   - 652
17039 - 2A0C40115ED0190E   - 262
17047 - 0705162B10FB2AC4   - 681
17055 - 7F3AC67F3CC61E28   - 854
17063 - 0430FA18042B22C4   - 603
17071 - 7F7EC87F2805 0687  - 759
17079 - A61806FED0120043E  - 556
17087 - 00180306030772A    - 357
17095 - CC7F3E30063C10FE   - 857
17103 - 3DFE17200238BFE    - 819
17111 - 00201218C0401115E  - 602
17119 - 0019060736D02B10   - 151
17127 - FBC3B5403E260E21   - 838
17135 - 21864034BE200736   - 566
17143 - 1C280C6920F510EE   - 799
17151 - ED5B0C40211A0019   - 488
17159 - 118240EB010500ED   - 689
17167 - B0C97A0005A0D00E1  - 738
17175 - C9 - 201
```

Listing 3.

```
 10 LET A=0
 20 FOR H=16514 TO 16518
 30 POKE H,28
 40 NEXT H
 50 POKE 17100,140
 60 LET D=0
 70 PRINT AT 0,1;"HIGH 000000
    SCORE 000000"
 80 PRINT AT 0,11-LEN STR$ A;A
 90 FOR F=1 TO 3
100 PRINT AT 1,14;"[redacted]";TAB
13;"[redacted]"
```



```
320 FOR N=1 TO 50
330 NEXT N
340 PRINT AT 10,13;"
350 FOR N=1 TO 2
360 PRINT AT N,2;"
370 FOR X=1 TO 5
380 NEXT X
390 PRINT AT N,2;"  "
400 NEXT N
410 PRINT AT 2,2;"  ";TAB 2;"
420 RAND USR 16519
430 LET B=PEEK 32766-256*PEEK 3
2767
440 LET C=PEEK B
450 IF C<>0 THEN GOTO 500
460 LET D=D+1
470 IF PEEK 17100>50 THEN POKE
17100,PEEK 17100-10
480 PRINT AT 10,10;"WELL DONE";
AT 12,2;"YOU HAVE COMPLETED LEVE
L ";D
490 GOTO 550
500 FOR N=1 TO 30
510 IF PEEK B>=128 THEN POKE B,
C
520 IF PEEK B<128 THEN POKE B,C
+128
530 NEXT N
540 PRINT AT 10,11;"LIVES=";3-F
550 PRINT AT 3,2;"
560 FOR N=2 TO 1 STEP -1
570 PRINT AT N,2;"
580 FOR X=1 TO 5
590 NEXT X
600 PRINT AT N,2;"  "
610 NEXT N
620 IF PEEK B=0 THEN GOTO 100
630 NEXT F
640 LET E=0
650 LET G=10000
660 FOR N=16514 TO 16515
670 LET E=E+((PEEK N-28)*G)
680 LET G=G/10
690 NEXT N
700 IF E>A THEN LET A=E
710 PRINT AT 12,7;"ANOTHER GAME
(Y/N)"
720 PRINT AT 10,11;"
730 PRINT AT 10,11;"GAME OVER"
740 IF INKEY$="Y" THEN GOTO 20
750 IF INKEY$<>"N" THEN GOTO 74
0
760 NEW
770 SAVE "THE MIN
780 POKE 16415,0
790 PRINT "";TAB 31;"";TAB 3
1;"
                THE MINE
                --------
";TAB 31;"
800 PRINT "  YOU HAVE LANDED AT
 AN OLD      DIAMOND MINE.YOU M
UST         COLLECT ALL FIVE D
IAMONDS     AND RETURN TO YOUR
 SPACESHIP  AS QUICKLY AS POSS
IBLE.YOU
810 PRINT "  GET FIFTY POINTS F
OR EACH     DIAMOND COLLECTED.
            YOU MUST AVOID FAL
LING ROCKS  AND HAMMERS WHICH
WILL CRUSH
820 PRINT "  YOU,AND THE GUARD
WHO CHASES  YOU.HE WILL KILL Y
OU IF HE    CATCHES YOU.
            USE THE CURSOR KEY
S TO MOVE.
830 PRINT "";TAB 31;"  PRESS
ANY KEY TO PLAY";TAB 3
1;"";TAB 31;"
840 IF INKEY$="" THEN GOTO 840
850 CLS
860 RUN
```

Extra colours. Listing 1.

```
10REM EXTRA COLOURS
20REM (C) by Rising Sun
30REM Electron branch
40@%=&00004
50VDU23,224,&AA,&55,&AA,&55,&AA,&55,&AA,&55,23,225,
255,255,255,255,255,255,255,255:DIMcol$(7)
60nu%=1
70IFL%=1234 GOTO90ELSEL%=1234:OSCLI"LOAD"""""+STR$~
(TOP-2)
80END
90PROCassemble:MODE1:VDU19,1,0;0;19,2,0;0;
100COLOUR1:COLOUR130:mode%=1:graphics%=-1
110DATAblack,red,green,yellow,blue,magenta,cyan,whit
e
120FORI%=0TO7:READcol$(I%):NEXT
130PRINT''''''STRING$(80," ")STRING$(40,CHR$224)STRI
NG$(80,CHR$225)
140COLOUR3:COLOUR128
150VDU5:GCOL0,0:PROCDPRINT(2,8,"Hello"):GCOL0,3:PROC
DPRINT(22,8,"Hello"):VDU4
160FORc1%=0TO7:FORc2%=c1%TO7
170PRINTTAB(0,13)"Number ";nu%TAB(0,14)col$(c1%)" mi
xed with "col$(c2%)"  .          "
180VDU19,1,c1%;0;19,2,c2%;0;
190get%=GET
200nu%=nu%+1:NEXT:NEXT
210REPEAT:PROCcol(RND(7),RND(7),RND(7),RND(7)):UNTIL
FALSE:END
220DEFPROCcol(A%,B%,C%,D%)
230CLS:PRINT'A%,B%,C%,D%'
240VDU19,0,A%;0;19,1,B%;0;19,2,C%;0;19,3,D%;0;
250FORI%=0TO3:FORJ%=0TO3:FORK%=0TO3:COLOURI%:COLOUR(
128+K%):VDU224,224,224,224:NEXT:PRINT:NEXT:NEXT:get%=G
ET:ENDPROC
```

Extra colours. Listing 2.

```
30001DEFPROCassemble
30002DIMQ%200
30003FORI%=0TO2STEP2
30004P%=Q%
30005[OPTI%
30006.def1 EQUD 0
30007.def2 EQUD 0
```

(continued on next page)

Extra colours

Tom Griffejoen, France.

BBC

THE DEMONSTRATION program, listing 1, shows how you can use 10 colours out of 36 on your Electron or BBC Micro in four colour modes and three out of 35 in two colour modes. The program doesn't work in Modes 2 and 5.

These colours can only be used as background colour, by filling a part of the screen with CHR$224, the two colours to be mixed being respectively the fore- and background colours. When you print any text over the coloured surface — in graphics mode after VDU5 — this text will be practically unreadable. That's why the second program is used. It enables you to print double-width characters. When these are printed over a coloured surface, they'll be more readable.

To see the demonstration, type in the first program and save it. Then type in the second one — don't forget to type New — and save it behind the first under the name "DPRINTrout". Now reload the first program, and Run it. It will load the second one and stop then. Type Run again to see the colours. If it does not start searching on the cassette after you've typed Run for the first time, try it again after having reset L% to 0. If it still doesn't work then, there probably is a bug in your program.

The second program can also be used on its own, in another program. You should then pass the mode in mode% and when you want the text to be printed at the graphics cursor, graphics% has to be True, otherwise False. To print something in double-width characters, type 'PROCDPRINT(X%,Y%, string$)', where X% and Y% are the co-ordinates of the first character, and string$ is the text you want to be printed. This is much like the command 'PRINTTAB(X%,Y%)string$'. To merge the second program with your program, type 'OSCLI"LOAD""DPRINTrout""+STR$~(TOP-2)'. The computer should now start loading. When it has finished, type End, then List and the programs are merged.

(continued from previous page)

```
30008.dpr LDA#23:JSR&FFEE:LDA#248:JSR&FFEE:LDX#0:.bigl
oop LDA#0:LDY#4:.loop ROLdef1,X:BCSverander:.resume DE
Y:BNEloop:JSR&FFEE:INX:CPX#8:BNEbigloop:JMPprint
30009.verander CPY#4:BEQfour:CPY#3:BEQthree:CPY#2:BEQt
wo
30010.one CLC:ADC#3:JMPresume
30011.two CLC:ADC#12:JMPresume
30012.three CLC:ADC#48:JMPresume
30013.four CLC:ADC#192:JMPresume
30014RTS
30015.print LDA#31:JSR&FFEE:LDA&70:JSR&FFEE:LDA&71:JSR
&FFEE:LDA#248:JSR&FFEE:RTS
30016]:NEXT
30017ENDPROC
30018
30019DEFPROCDPRINT(xx%,yy%,A$):LOCALX%
30020IFmode%=1ORmode%=4ORmode%=6 width%=40
30021IFmode%=0ORmode%=3 width%=80
30022IFmode%=2ORmode%=5 width%=20
30023IFmode%=3ORmode%=6:height%=25 ELSEheight%=32
30024FORQ%=1TOLENA$:!def1=!(&C000+8*(ASC(MID$(A$,Q%,1)
)-32)):!def2=!(&C000+8*(ASC(MID$(A$,Q%,1))-32)+4)
30025IFgraphics% GOTO30029
30026FORZ%=0TO1:?&70=xx%:?&71=yy%:CALLdpr
30027xx%=xx%+1:NEXT
30028IFxx%>=width% xx%=0:yy%=yy%+1:NEXT:PRINT:ENDPROC
ELSENEXT:PRINT:ENDPROC
30029FORZ%=0TO1:MOVE1279*(xx%/width%),1023-(1023*(yy%/
height%))
30030CALLdpr:xx%=xx%+1:NEXT:IFxx%>=width% xx%=0:yy%=yy
%+1:NEXT:PRINT:ENDPROC ELSENEXT:PRINT:ENDPROC
```

Picasso's paintbrush

Matthew Sillett,
Dulwich,
London SE21.

BBC

THE TEXT FOR this program was published in January Software File without its listing. Here is the full program. Picasso's Paintbrush is a multi-feature drawing program for the BBC Micro. Impressive pictures can be created quickly and easily using the many built-in functions.

- ☐Automatic circle, triangle, semi-circle rectangle and ellipse drawing routines
- ☐Extensive colour mixing.
- ☐Three cursor speeds.
- ☐Three line thicknesses.
- ☐Rubber band facility.
- ☐Load and Save screens.
- ☐Spray colour option.
- ☐Print text anywhere on the screen.
- ☐Colour-fill routine.
- ☐Full MODE2 colour graphics

The program contains full instructions of how to operate these functions and the keys involved — all 30 of them. There are three methods of colour mixing provided, all of which are very easy to use.

The first way is to fill the area involved in one of the two colours to be mixed — e.g., red — and then to overlay it with alternate pixels of the second colour — e.g., yellow. The combination of Red and yellow produces a very good orange.

The second way is the same as above, but to overlay with horizontal lines — e.g., a darker orange may be produced using this method. The final method is to use high GCOL values to produce "hatching". On pressing the specified key, you must enter this value — e.g., 198 produces a good brown, when the colour is set to white.

Copies of the program are available for £3.50 from: M. J. Sillett, 41, College Rd., Dulwich, London SE21.

```
10REM (c)AUGUST 1984 M.J.SILLETT
20:
30REM N.B. To save picture hit f8,
40REM position tape and hit RETURN
50:
60ONERRORRUN
70VDU6
80MODE2
90VDU5:VDU6
100X=633:Y=550:D=0:OX=X:OY=Y:OZ=X:OW=Y:PX1=-1:PY1=0:
PX2=-1:PY2=0:Q=0:G=0:U=0:y=1:col=7
110XP=576:P=0:R=0:B=0:C=0:S=1
120E=1:A=1:W=0
130PROCscreen
140VDU24,25;98;1255;1000;
150PROCcursor(y)
160IFX<25 X=25
170IFX>1255 X=1255
180IFY<98 Y=98
190IFY>1000 Y=1000
200VDU24,25;20;1255;1000;:GCOL0,7:MOVEXP,70:PRINTCHR
$228
210IFXP<>128 GCOL0,0:MOVEXP-64,70:PRINTCHR$228
220IFXP=128AND col=0GCOL0,0:MOVE1088,70:PRINTCHR$228
230VDU24,25;98;1255;1000;
240OX=X:OY=Y
250IFINKEY(-26)X=X-8
260IFINKEY(-26)AND INKEY(-1)X=X-32
270IFINKEY(-26)AND INKEY(-98)X=X-128
280IFINKEY(-122)X=X+8
290IFINKEY(-122)AND INKEY(-1)X=X+32
300IFINKEY(-122)AND INKEY(-98)X=X+128
310IFINKEY(-58)Y=Y+4
320IFINKEY(-58)AND INKEY(-1)Y=Y+16
330IFINKEY(-58)AND INKEY(-98)Y=Y+64
340IFINKEY(-42)Y=Y-4
350IFINKEY(-42)AND INKEY(-1)Y=Y-16
360IFINKEY(-42)AND INKEY(-98)Y=Y-64
370IFINKEY(-33)G=0:y=1
380IFINKEY(-114)Q=0:y=0
390IFINKEY(-115)GOSUB 700
400IFINKEY(-116)GOSUB 710
410IFINKEY(-21)GOSUB 720
420IFINKEY(-117)ANDINKEY(-1)=FALSE PROCcirc(1)
430IFINKEY(-117)ANDINKEY(-1) PROCcirc(3)
440IFINKEY(-24)PROCelipse
450IFINKEY(-89)PROCcirc(2)
460IFINKEY(-72)PROCr(1)
470IFINKEY(-73)PROCr(2)
480IFINKEY(-118)GCOL3,128+col:CLG
490IFINKEY(-23)y=1:PROCwrite:GOTO150
500IFINKEY(-119)PROCsave
510IFINKEY(-120)PROCload
520IFINKEY(-99)col=col+1:SOUND1,-15,10,1:IFcol<>16 )
P=(P+64:GOTO150:ELSE IF col=16col=0:XP=128:GOTO150
530IFINKEY(-97)Q=1:y=0
540IFINKEY(-88)FX=X:FY=Y:QY=Y:PROCf
550IFINKEY(-102)DX=X:A=POINT(X,Y):REPEAT:S=1:GCOLD,c
ol:C=POINT(X,Y):PROCp(X,Y):y=1:IFP=1ANDR=1:X=X+8:P=0:R
=0:UNTILB=1:E=0:X=DX:REPEAT:S=2:GCOLD,col:C=A:PROCp(DX
,Y):y=1:IFP=1ANDR=1:DX=DX-8:P=0:R=0:UNTILB=1:B=0:S=1:G
OTO680
560IFINKEY(-103)DX=X:A=POINT(X,Y):REPEAT:S=1:GCOLD,c
ol:C=POINT(X,Y):PROCz(X,Y):y=1:IFP=1ANDR=1:X=X+8:P=0:R
=0:UNTILB=1:E=0:X=DX:REPEAT:S=2:GCOLD,col:C=A:PROCz(DX
,Y):y=1:IFP=1ANDR=1:DX=DX-8:P=0:R=0:UNTILE=1:B=0:S=1:G
OTO680
570IFINKEY(-104)DX=X:A=POINT(X,Y):E=1:REPEAT:S=1:GCO
LD,col:C=POINT(X,Y):PROCb(X,Y):y=1:IFP=1ANDR=1:X=X+8:P
=0:R=0:UNTILE=1:B=0:E=1:X=DX:REPEAT:S=2:GCOLD,col:C=A:
PROCb(DX,Y):y=1:IFP=1ANDR=1:DX=DX-8:P=0:R=0:UNTILB=1:B
=0:S=1:GOTO680
580IFINKEY(-2)Q=2:y=0
590IFINKEY(-90)AND INKEY(-1)GOSUB 760:GOTO150
600IFINKEY(-90)VDU21:INPUTTAB(5,1)D:VDU6:GOSUB 780:G
OTO150
610IFINKEY(-25)GCOLD,RND(7):PLOT69,X+RND(40),Y+RND(4
0):PLOT69,X-RND(40),Y-RND(40):PLOT69,X+RND(40),Y-RND(4
0):PLOT69,X-RND(40),Y+RND(40)
620IFINKEY(-121)GCOLD,col:PLOT69,X+RND(40),Y+RND(40)
:PLOT69,X-RND(40),Y-RND(40):PLOT69,X-RND(40),Y-RND(40)
:PLOT69,X-RND(40),Y+RND(40)
630*FX15,0
640IFY<90GOTO150
650IFINKEY(-74) ANDPX1<0GOSUB730:SOUND1,-15,50,2:GOT
O150
660IFINKEY(-74) ANDPX2<0 GOSUB740:SOUND1,-15,75,2:GO
TO150
670IFINKEY(-74) GOSUB750:SOUND1,-15,100,2:GOTO150
680GOTO150
690END
700OZ=X:OW=Y:y=1:G=1:GCOLD,col:MOVEX,Y:DRAWX,Y:RETUR
N
710GCOLD,col:MOVEOZ,OW:DRAWX,Y:RETURN
720GCOL0,0:MOVEOZ,OW:DRAWX,Y:RETURN
730GCOLD,col:MOVEX,Y:DRAWX,Y:PX1=X:PY1=Y:RETURN
740GCOLD,col:MOVEX,Y:DRAWX,Y:PX2=X:PY2=Y:U=1:RETURN
750GCOLD,col:MOVEX,Y:DRAWPX2,PY2:PLOT85,PX1,PY1:U=0:
PX1=-100:PY1=-100:PX2=-100:PY2=-100:RETURN
760*FX9,8
770RETURN
780*FX9,25
790RETURN
800DEFPROCscreen
810GCOL0,7:MOVE10,5:DRAW1270,5:DRAW1270,1014:DRAW10,
1014:DRAW10,5:MOVE15,10:DRAW1265,10:DRAW1265,1009:DRAW
15,1009:DRAW15,10
820VDU4:COLOUR7:PRINTTAB(1,30)CHR$225:FORF=0TO15:COL
```

```
OURF:PRINTTAB(2+F,30)CHR$227:NEXT:VDU5:MOVE15,85:DRAW1
265,85:MOVE15,90:DRAW1265,90
  830ENDPROC
  840DEF PROCcursor(x)
  850GCOL3,7:FORF=1TO4:MOVEX+24,Y:DRAWX-24,Y:MOVEX,Y+2
4:DRAWX,Y-24:NEXT
  860IFx=1 ENDPROC
  870IFX=OX AND Y=OY ENDPROC
  880GCOLD,col
  890IFQ=0 MOVEOX,OY:DRAWX,Y
  900IFQ=1 MOVEX-26,Y+12:PRINTCHR$224
  910IFQ=2 MOVEX-44,Y+4:PRINTCHR$226
  920ENDPROC
  930DEFPROCcirc(N)
  940*FX15,1
  950VDU21:INPUTTAB(5,1)S:VDU6:MOVEX,Y:GCOLD,col:IF N=
1FOR I%=0TO360 STEP10:MOVEX,Y:PLOT85,COSRAD(I%)*(10+S)
+X,SINRAD(I%)*(10+S)+Y:NEXT
  960IF N=2FOR I%=0TO180 STEP10:MOVEX,Y:PLOT85,COSRAD(
I%)*(10+S)+X,SINRAD(I%)*(10+S)+Y:NEXT
  970IF N=3MOVECOSRAD(0)*(10+S)+X,SINRAD(0)*(10+S)+Y:F
ORI%=0TO360:DRAWCOSRAD(I%)*(10+S)+X,SINRAD(I%)*(10+S)+
Y:NEXT
  980VDU26
  990ENDPROC
 1000DEFPROCelipse:VDU21:INPUTTAB(0,5)X%:INPUTTAB(0,5)
Y%:VDU6:GCOLD,col:MOVEX,Y:FORI%=0TO360STEP2:MOVEX,Y:PL
OT85,SIN(RAD(I%))*X%+X,COS(RAD(I%))*Y%+Y:NEXT:ENDPROC
 1010DEFPROCr(H)
 1020*FX15,0
 1030VDU21:INPUTTAB(0,5)U:INPUTTAB(0,5)V:VDU6:GCOLD,co
l:IFH=1MOVEX+U,Y-V:DRAWX+U,Y+V:DRAWX-U,Y+V:DRAWX-U,Y-V
:DRAWX+U,Y-V
 1040IFH=2MOVEX+U,Y-V:DRAWX+U,Y+V:PLOT85,X-U,Y+V:DRAWX
-U,Y-V:PLOT85,X+U,Y-V
 1050ENDPROC
 1060DEFPROCwrite
 1070*FX15,0
 1080GCOL0,col
 1090A$=GET$:MOVEX-6,Y+12:PRINTA$:X=X+64:ENDPROC
 1100DEFPROCsave
 1110VDU24,25;20;1255;1000;:GCOL0,0:MOVE XP,70:PRINTCH
R$228:XP=576:col=7:GCOL0,7:MOVE XP,70:PRINTCHR$228:VDU
24,25;90;1255;1000;
 1120*SAVE SCREEN 3000 8000
 1130ENDPROC
 1140DEFPROCload
 1150*LO. SCREEN
 1160VDU24,25;20;1255;1000;:GCOL0,0:MOVE XP,70:PRINTCH
R$228:VDU24,25;90;1255;1000;
 1170y=1:X=633:Y=505:XP=576:col=7
 1180ENDPROC
 1190DEFPROCb(x,y)
 1200G=E
 1210q=y:z=y
 1220IFS=1 IFPOINT(x+8,y)<>C D=1
 1230IFS=2 IFPOINT(x-8,y)<>C D=1
 1240REPEAT
 1250IFPOINT(x,q+4)<>C:P=1
 1260IFPOINT(x,z-4)<>C:R=1
 1270IFc=y AND E=2 ANDINKEY(-74)=FALSE MOVE x,y:PLOT69
,x,y
 1280IFP=0ANDE=1:MOVE x,q:PLOT69,x,q+4
 1290IFR=0ANDE=1:MOVE x,z:PLOT69,x,z-4
 1300q=q+4:z=z-4
 1310IFINKEY(-74)P=1:R=1:D=1
 1320E=E+1:IFE=3 E=1
 1330UNTILP=1 AND R=1
 1340IFG=1 E=2
 1350IFG=2 E=1
 1360IFD=1 B=1:D=0
 1370ENDPROC
 1380DEFPROCf
 1390GCOLD,col
 1400REPEAT
 1410PLOT77,FX,FY
 1420FY=FY+4
 1430UNTILPOINT(FX,FY)<>0
 1440REPEAT
 1450PLOT77,FX,QY
 1460QY=QY-4
 1470UNTILPOINT(FX,QY)<>0
 1480ENDPROC
 1490DEFPROCz(x,y)
 1500q=y:z=y
 1510IFS=1 IFPOINT(x+8,y)<>C D=1
 1520IFS=2 IFPOINT(x-8,y)<>C D=1
 1530REPEAT
 1540W=W+1
 1550IFP=0AND W=1 MOVE x,c:PLOT69,x,q
 1560IFR=0AND W=1 MOVE x,z:PLOT69,x,z
 1570IFPOINT(x,q+4)<>C:P=1
 1580IFPOINT(x,z-4)<>C:R=1
 1590q=q+4:z=z-4
 1600IFINKEY(-74)P=1:R=1:D=1
 1610IFW=2W=0
 1620UNTILP=1 AND R=1:W=0
 1630IFD=1 B=1:D=2:E=2
 1640ENDPROC
 1650DEFPROCp(x,y)
 1660q=y:z=y
 1670IFS=1 IFPOINT(x+8,y)<>C D=1
 1680IFS=2 IFPOINT(x-8,y)<>C D=1
 1690REPEAT
 1700W=W+1
 1710IFP=0MOVE x,q:PLOT69,x,q
 1720IFR=0MOVE x,z:PLOT69,x,z
 1730IFPOINT(x,q+4)<>C:P=1
 1740IFPOINT(x,z-4)<>C:R=1
 1750q=q+4:z=z-4
 1760IFINKEY(-74)P=1:R=1:D=1
 1770UNTILP=1 AND R=1
 1780IFD=1 B=1:D=0:E=2
 1790ENDPROC
```

Artist

John McHale,
Sligo,
Eire.

CBM-64

THIS PROGRAM USES the CBM-64's hi-resolution graphics facilities and enables you to draw impressive pictures on screen with the added bonus of being able to save any picture created, to tape with the touch of one key.

```
 0 REM * BASIC LOADER FOR MACHINE CODE *
 1 REM ********************
 2 REM * JOYSTICK ART.. *
 3 REM * FOR THE CBM 64 *
 4 REM * WRITTEN BY     *
 5 REM * JOHN MC HALE   *
 6 REM * SLIGO,EIRE.....*
 7 REM ********************
 8 PRINT"■■■THIS PROGRAM USES A JOYSTICK IN PORT  2.":FORT=0TO2000:NEXT
 10 C=C+1 IFC=2THENSYS49588
 20 PRINT"■■■ PLEASE WAIT , LOADING  'ARTIST CBM 64' "
 30 FORT=0TO2000:NEXT
 40 LOAD"",1,1
```

```
 10 REM * PROGRAM 2 , HEX CODE LOADER *
 12 GOSUB500
 100 ADI=49152:TL=0 :PRINT"■■■PLEASE WAIT , LOADING MACHINE CODE NOW ."
 110 READHX$:IFHX$="XX"THEN200
 120 FORT=0TO7
 130 H=ASC(MID$(HX$,T*2+1,1))-48:IFH>9"HENH=H-7
 140 L=ASC(MID$(HX$,T*2+2,1))-48:IFL>9"HENL=L-7
 150 POKEADD+T,H*16+L TL=TL+H*16+L:NEXT"NEXT"ADD=ADD+8:GOTO110
 200 IFADD<>5007ZTHENPRINT"■■■INSUFFICIENT DATA !":STOP
 210 IFTL<>124790THENPRINT"■■■ERROR IN DATA INPUT !":STOP
 220 PRINT"■■■ THE DATA HAS BEEN SUCCESFULLY ENTERED ";
 230 PRINT"AND HAS BEEN LOADED INTO MEMORY FROM "
 240 PRINT"49152 ($C000) ONWARDS .                "
 250 PRINT"YOU NOW HAVE THE FOLLOWING OPTIONS ;"
 260 PRINT:PRINT"1. SAVE THE MACHINE CODE TO TAPE"
 270 PRINT:PRINT"2. RUN THIS PROGRAM"
 280 PRINT:PRINT
 290 INPUT"OPTION NO.";OPT
 300 IFOPT<>1ANDOPT<>2THEN290
 310 IFOPT=1THEN500
 320 PRINT"■■■HAS THE MACHINE CODE BEEN SAVED (Y/N)"
 330 POKE197,64:GETAN$:IFAN$=""THEN330
 340 IFAN$<>"Y"THEN220
 350 SYS64738
 500 PRINT"■■■ SAVING MACHINE CODE TO TAPE::::::::::::"
 510 PRINT"NOTE: YOU SHOULD SAVE THE MACHINE CODE"
 520 PRINT"ON THE SAME TAPE AS PROGRAM!! IE. THE"
 530 PRINT"THE BASIC LOADER, MAKING SURE TO WIND"
 540 PRINT"THE TAPE FORWARD A FEW TAPE COUNTS PAST"
 550 PRINT"THE END OF PROGRAM :, IN ORDER TO AVOID"
 560 PRINT"ANY OVERLAP WHICH CAN CAUSE LOAD ERRORS"
 570 PRINT:PRINT"PLACE CASSETTE IN RECORDER."
 579 GOTO630
 580 FORT=0TO51:READDC:POKE501"6+T,DC:NEXT
 585 RETURN
 590 DATA169,0,133,248,169,192,133,249,169,160,133,250,169,195
 600 DATA133,251,169,1,170,168,32,186,255
 610 DATA169,10,162,42,160,196,32,189,255
 620 DATA166,250,164,25,169,248,32,216,255,96,65,82,84,73,83,84,45
 630 POKE788,52:PRINT"PRESS 'F1' TO CONTINUE WITH SAVE. ANY"
 635 DATA52,54,46
 640 PRINT"OTHER TO ABANDON OPTION !"
 650 GETAN$:IFAN$=""THEN650
 660 IFAN$<>"■"THEN220
 670 SYS49176:GOTO220
 999 REM * SPRITE DATA       *
```

(continued on next page)

(continued from previous page)

```
1000 DATA0000EC180006300
1001 DATA0022000003000022
1002 DATA0000630003C18000
1003 DATA0000000000000000
1004 DATA0000000000000000
1005 DATA0000000000000000
1006 DATA0000000000000000
1007 DATA0000000000000000
1008 REM ***************
1999 REM * MACHINE CODE DATA *
2000 DATA2408FFBF9D3F03
2001 DATACA80F760A9008DFC
2002 DATACF8DFFCFA000C4A
2003 DATA8005A0018CFECF4A
2004 DATA8005A002CFECF4A
2005 DATA8A5A0A9AFFCF4A
2006 DATA800A2018FFCF4A
2007 DATA8006A5018DFDCF60
2008 DATA9008DFDCF60A900
2009 DATA85F8A92085F9A900
2010 DATA99009DFBE6FB00FA
2011 DATAE6F9A5F9C9400DF0
2012 DATA60AD15D0090185D15
2013 DATA4D0A9188D00D0EDF8
2014 DATACFA9328D01D0A9A9
2015 DATA4CFA9008DFCCFF900
2016 DATA8DFACFA9208DFBCF
2017 DATA2040C0A90D8DF007
2018 DATAA9048DF7CF60FDFE
2019 DATACFD003EAEAEAC901
2020 DATAD036ADF9CF38E901
2021 DATAC931D0015008DF9CF
2022 DATA8D0110ADF7CF38E9
2023 DATA8D11C9FFD017A9078D
2024 DATAF7CFFDFACF38E940
2025 DATA8DFACFADFBCFE901
2026 DATA8DFBCF6038F7CF60
2027 DATA8D02C0FBADF9CF10
2028 DATA6901C9F200160BD
2029 DATAF9CF8D01D0ADF7CF
2030 DATA1869E1C938D017A9
2031 DATA00D0F7CFADFACF16
2032 DATA69408DFACFADFBCF
2033 DATA69018DFBCF60BDF7
2034 DATACF60ACF7CFADFACF
2035 DATA85F8ADFBCF05FDD1
2036 DATAF80DFCCF91FDA20F
2037 DATAA0088D0FDCD00F8
2038 DATA60EAEAEAEAEAEAEA
2039 DATAEFFAAD11DAA9208D
2040 DATA11D0AD18D0050BD
2041 DATA16D06ADFCFD001
2042 DATA6EC901D038AD10D0
2043 DATA2501F815ADF8CF18
2044 DATA6901C94F30016BD
2045 DATAF8CF8D0080201C2
2046 DATA6EADF9CF18690190
2047 DATA0F48AD10D0290180
2048 DATA10D068DF8CF3D00
2049 DATAD0201C268C902D0
2050 DATAF3AD10D02501F024
2051 DATAADF8CF38E501B012
2052 DATA8DF8CF8D0F0AA1A
2053 DATAD029FE8D1ED02833
2054 DATAC2608DF8CF8D08D0
2055 DATA2033C268ADF8CF38
2056 DATAE901C9.7D0016B8D
2057 DATAF8CF8D00D2033C2
2058 DATA60ADFCCF184A8004
2059 DATA8DFCCF60A9008DFC
2060 DATAFCADFACF18690B8D
2061 DATAFAL=ADFBCF69008D
2062 DATAFBC760ADFCCF180A
2063 DATAD0048DFCCF60A991
2064 DATA8DFCCFADFACF38E9
2065 DATA0080FACFA9F8CF
2066 DATA008DFBCF60A5C5C9
2067 DATA03D0072005C22040
2068 DATAC063C904D0122086
2069 DATAC0D101202C60A10
2070 DATAD020A1C020A9C160
2071 DATAC905D004C0A9C360
2072 DATAC906D0FBE6322059
2073 DATAC200EADEADEAEA6A
2074 DATAEAEAEAEAEAEAEAEA
2075 DATAEAEAA9008578A904
2076 DATA85F9A900A5029F8
2077 DATAFAF8A9AFAF005F9
2078 DATAC908D0F0A900D0F8
2079 DATA0760ADFACF85F8AD
2080 DATAFBCF85F9ADF7CFA9
2081 DATA0001F6604849205
2082 DATA4553204152544D11
2083 DATAD029DF8D11D0D018
2084 DATAD029F70D18D0F900
2085 DATA8D:5D0A90201E2FF
2086 DATAA9005F885FAF920
2087 DATA85F9A94085FBF901
2088 DATA0A01A001200AFFF9
2089 DATA0A02C0A0C220IDFF
2090 DATA46FAA4FBA9F820D0
2091 DATAFFA9018D15D02040
2092 DATA0A90186DF807F293
2093 DATA2082FFA000A200CA
2094 DATA0DF0050E8E8E8EA
2095 DATA0A0D1D1D020A1C0
2096 DATA20AC1602040C0A9
2097 DATA0160F837A9000D10
2098 DATAD007AC1E8E8E820
2099 DATA8A0U/A0UU20D6C0
2100 DATA20BC18DFDCFF003
2101 DATA2052C12055C2A900
2102 DATAA2F0CA00FD00F8
2103 DATA0A0CA0AFBC85F8A0
2104 DATA0A0A0A0A0A0A0A0A
2105 DATA0DC1F8A0C008D0F9
2106 DATA6000000000000300
2107 REM ***************
2108 DATA00
```

Lander

David Hodgetts,
Tiptor.,
West Midlands.

VIC-20

LANDER IS a game for the unexpanded Vic-20 and a joystick. The game comes in six parts, the first is a loading screen, the next four are for the machine code and graphics, and the last part is the actual game.

The idea of the game is to guide your landing craft through an asteroid belt and land it safely on the pad below. To make things more difficult there is a time limit which is displayed at the bottom of the screen, try and be as fast as possible as your score is based on how much time you have left after landing your craft. As you drop the speed of your craft increases, so if you want to slow your descent you can thrust by pulling back the joystick, but you cannot go upwards.

At the start of the game there is a title page with two options, F1 for the start velocity of the landing craft, and F3 for the asteroid speed. As the levels get higher the asteroids get faster, but the start velocity of your craft remains constant.

Type in and save each of the programs, in order, one after the other, and load using shifted run-stop. Each of the data programs has a check sum to make sure that the data is correct, as if there is a mistake in the data it could cause the program to crash, so if you get a data error re-check the data and re-save the corrected version.

If there are no data errors then each program will load the next. After each part has finished loading then the border colour of the screen will change.

Program 1.

```
10 POKE36879,8:PRINT"■"
20 PRINT"■■■■■■■■■LANDER":PRINT"■■■BY DAVID MCDGETTS"
30 PRINT"■■■■■■■■(C) 1984"
40 PRINT"■■■■PLEASE WAIT..."
50 FORA=0TO9 POKE631+A,PEEK(60916+A):NEXT POKE198,9
```

Program 2.

```
100 S=7168:FORI=STOS+511:READX:C=C+X:POKEI,X:NEXT
110 IFC<>36511THENPRINT"DATA ERROR!!":END
120 DATA3,15,31,50,50,63,50,18
130 DATA192,240,248,76,76,252,76,72
140 DATA31,7,13,25,49,49,49,49
150 DATA248,224,176,152,140,140,140,140
160 DATA34,4,17,4,0,0,0,1
170 DATA132,16,64,8,160,0,128,0
180 DATA0,1,7,31,60,57,123,127
190 DATA0,160,248,223,158,168,230,199
200 DATA125,239,231,247,127,121,29,7
210 DATA255,207,190,250,242,228,216,48
220 DATA16,58,127,255,255,255,255,255
230 DATA255,255,255,255,255,255,255,255
240 DATA12,16,38,72,147,164,41,10
250 DATA48,8,100,18,201,37,148,80
260 DATA10,41,164,147,72,38,16,12
270 DATA80,148,37,201,18,100,8,48
280 DATA24,24,24,60,36,60,36,90
290 DATA102,66,126,66,255,129,255,255
300 DATA0,0,0,0,0,0,0,0
310 DATA0,0,0,0,0,0,0,0
320 DATA0,0,0,0,0,0,0,0
330 DATA0,0,0,0,0,0,0,0
340 DATA0,0,0,0,0,0,0,0
350 DATA0,0,0,0,0,0,0,0
360 DATA0,0,0,0,0,0,0,0
370 DATA0,0,0,0,0,0,0,0
380 DATA0,0,0,0,0,0,0,0
390 DATA0,0,0,0,0,0,0,0
400 DATA0,0,0,0,0,0,0,0
410 DATA0,0,0,0,0,0,0,0
420 DATA0,0,0,0,0,0,0,0
430 DATA0,0,0,0,0,0,0,0
440 DATA0,0,0,0,0,0,0,0
450 DATA255,0,0,0,0,0,0,255
460 DATA255,0,128,128,128,128,0,255
470 DATA255,0,192,192,192,192,0,255
480 DATA255,0,224,224,224,224,0,255
490 DATA255,0,240,240,240,240,0,255
500 DATA255,0,248,248,248,248,0,255
510 DATA255,0,252,252,252,252,0,255
520 DATA255,0,254,254,254,254,0,255
530 DATA255,0,255,255,255,255,0,255
540 DATA0,0,0,0,0,0,0,0
550 DATA0,0,0,0,0,0,0,0
560 DATA0,0,0,0,0,0,0,0
570 DATA0,0,0,0,0,0,0,0
580 DATA0,0,0,0,0,0,0,0
590 DATA0,0,0,0,0,0,0,0
600 DATA0,0,0,0,0,0,0,0
610 DATA0,0,0,0,0,0,0,0
620 DATA0,0,0,0,0,0,0,0
630 DATA0,0,0,0,0,0,0,0
640 DATA160,0,169,10,153,206,31,169
650 DATA5,153,206,151,152,201,5,144
660 DATA10,169,41,153,228,31,169,2
670 DATA153,228,151,200,192,22,208,226
680 DATA96,0,0,0,0,0,0,0
690 DATA0,0,0,0,0,0,0,0
700 DATA162,0,254,44,150,189,44,150
710 DATA41,8,240,5,169,1,157,44
720 DATA150,232,224,110,208,236,96,169
730 DATA23,133,55,133,52,96,169,255
740 DATA141,5,144,169,8,141,15,144
750 DATA96,0,0,0,0,0,0,0
800 POKE36879,10:PRINT"■■■■■■■■■■"
810 FORA=0TO9 POKE631+A,PEEK(60916+A):NEXT:POKE198,9
```

Program 3.

```
100 S=6656:FORI=STOS+511:READX:C=C+X:POKEI,X:NEXT
110 IFC<>50002THENPRINT"DATA ERROR!!":END
120 DATA160,0,177,1,201,5,176,15
130 DATA200,192,2,208,245,160,22,177
140 DATA1,201,6,176,13,200,192,24
150 DATA208,245,96,201,32,240,233,76
160 DATA82,26,201,32,240,239,76,82
170 DATA26,96,160,0,169,32,145,1
180 DATA200,145,1,160,22,145,1,200
190 DATA145,1,173,53,3,240,18,160
200 DATA44,173,54,3,145,1,173,53
210 DATA3,200,145,1,169,0,141,53
220 DATA3,96,141,56,3,201,11,208
230 DATA15,56,165,1,233,22,176,2
240 DATA198,2,133,1,32,172,26,234
250 DATA120,162,191,160,234,142,20,3
260 DATA140,21,3,88,96,173,53,3
270 DATA240,13,160,44,173,54,3,145
280 DATA1,200,173,55,3,145,1,160
290 DATA0,169,12,145,1,162,2,32
300 DATA226,27,200,169,13,192,2,208
310 DATA242,160,22,169,14,145,1,162
320 DATA2,32,226,27,200,169,15,192
```

```
330 DATA24,208,242,96,173,53,3,240
340 DATA13,160,44,173,54,3,145,1
350 DATA200,173,55,3,145,1,96,0
360 DATA169,176,162,4,221,6,30,208
370 DATA5,202,224,255,208,246,162,4
380 DATA254,6,30,169,186,221,5,30
390 DATA208,10,169,176,157,6,30,202
400 DATA224,255,208,236,96,162,0,32
410 DATA245,25,189,0,150,41,8,240
420 DATA5,159,7,32,151,25,232,224
430 DATA22,208,236,96,0,0,0,0
440 DATA162,32,160,30,134,1,132,2
450 DATA169,1,141,52,3,169,0,141
460 DATA53,3,141,56,3,120,162,34
470 DATA160,27,142,20,3,140,21,3
480 DATA88,96,120,32,0,26,206,52
490 DATA3,240,3,76,36,24,169,16
500 DATA141,52,3,173,47,27,201,4
510 DATA144,3,205,47,27,32,42,26
520 DATA169,0,141,19,145,169,127,141
530 DATA34,145,159,16,44,17,145,208
540 DATA10,198,1,165,1,201,255,208
550 DATA2,198,2,169,128,44,32,145
560 DATA208,6,230,1,208,2,230,2
570 DATA24,165,1,105,22,144,2,230
580 DATA2,133,1,169,8,44,17,145
590 DATA208,36,238,47,27,238,47,27
600 DATA173,47,27,201,32,144,5,169
610 DATA32,141,47,27,160,44,177,1
620 DATA141,54,3,200,177,1,141,55
630 DATA3,169,1,141,53,3,32,0
640 DATA26,160,0,152,145,1,162,3
650 DATA32,226,27,200,192,2,208,243
660 DATA160,22,169,2,145,1,162,3
670 DATA32,226,27,169,3,200,192,24
680 DATA208,242,173,53,3,240,23,160
690 DATA44,169,4,234,145,1,162,2
700 DATA32,226,27,200,169,5,234,145
710 DATA1,162,2,32,226,27,76,36
720 DATA24,0,165,1,141,242,27,155
730 DATA2,41,3,9,148,141,243,27
740 DATA138,153,119,150,96,0,0,0
750 DATA0,0,0,0,0,0,0,0
800 POKE36879,12:PRINT"[illegible]"
810 FORA=0TO9:POKE631+A,PEEK(60916+A):NEXT:POKE198,9
```

Program 4.

```
100 S=6400:FORI=STOS+255:READX:C=C+X:POKEI,X:NEXT
110 IFC<>25259THENPRINT"DATA ERROR!!":END
120 DATA173,53,3,240,18,160,0,185
130 DATA54,3,201,6,240,242,201,7
140 DATA240,238,200,192,2,208,240,162
150 DATA43,160,30,134,3,132,4,160
160 DATA1,140,60,3,177,3,201,6
170 DATA240,15,200,192,23,208,242,32
180 DATA196,25,165,4,201,32,208,231
190 DATA96,32,160,25,24,165,3,105
200 DATA22,144,2,230,4,133,3,172
210 DATA60,3,32,160,25,172,60,3
220 DATA136,208,2,160,22,140,61,3
230 DATA165,8,145,3,32,176,25,200
240 DATA192,25,208,2,160,1,169,9
250 DATA145,3,32,176,25,56,165,3
260 DATA233,22,176,2,198,4,133,3
270 DATA172,61,3,169,6,145,3,32
280 DATA176,25,200,192,24,208,2,160
290 DATA1,169,7,145,3,32,176,25
300 DATA172,60,3,76,42,25,0,157
310 DATA0,150,157,228,151,96,0,0
320 DATA169,32,145,3,200,192,24,208
330 DATA2,160,1,145,3,96,0,0
340 DATA165,3,141,193,25,165,4,41
350 DATA3,9,148,141,194,25,169,2
360 DATA153,249,151,96,165,3,24,105
370 DATA56,144,2,230,4,133,3,96
380 DATA160,0,169,32,153,22,30,153
390 DATA206,30,169,1,153,22,150,153
400 DATA206,150,136,208,237,96,165,1
410 DATA141,251,24,165,2,41,3,9
420 DATA148,141,252,24,96,222,0,150
430 DATA222,228,151,96,0,0,0,0
800 POKE36879,13:PRINT"[illegible]"
810 FORA=0TO9:POKE631+A,PEEK(60916+A):NEXT:POKE198,9
```

Program 5.

```
100 S=6144:FORI=STOS+255:READX:C=C+X:POKEI,X:NEXT
110 IFC<>27675THENPRINT"DATA ERROR!!":END
120 DATA160,0,165,22,30,201,7,208
130 DATA7,169,6,136,153,22,30,200
140 DATA185,242,30,201,7,208,7,169
150 DATA6,136,153,242,30,200,200,192
160 DATA242,208,223,96,206,63,3,240
170 DATA3,76,191,234,162,3,142,63
180 DATA3,174,62,3,222,232,31,189
190 DATA232,31,201,33,208,13,206,62
200 DATA3,208,8,32,104,26,162,255
210 DATA142,56,3,76,191,234,0,0
220 DATA162,160,142,10,144,32,120,24
230 DATA174,62,3,222,232,31,189,232
240 DATA31,201,33,208,5,206,62,3
250 DATA240,25,32,192,26,162,192,142
260 DATA10,144,32,120,24,76,80,24
270 DATA162,16,160,255,136,208,253,202
280 DATA208,250,96,238,62,3,162,128
290 DATA142,10,144,32,120,24,174,62
300 DATA3,254,232,31,189,232,31,201
310 DATA41,144,10,238,62,3,173,62
320 DATA3,201,18,240,11,162,176,142
330 DATA10,144,32,120,24,76,134,24
340 DATA162,0,142,10,144,96,173,53
350 DATA3,240,6,162,128,142,13,144
360 DATA96,162,0,142,13,144,96,160
370 DATA0,169,2,32,250,24,160,23
380 DATA32,250,24,160,1,169,7,32
390 DATA250,24,160,22,32,250,24,96
400 DATA160,1,169,2,32,250,24,160
410 DATA22,32,250,24,160,0,169,7
420 DATA32,250,24,160,23,32,250,24
430 DATA96,0,153,119,150,96,0,0
800 POKE36879,14:PRINT"[illegible]"
810 FORA=0TO9:POKE631+A,PEEK(60916+A):NEXT:POKE198,9
```

Program 6.

```
10 SYS7655 A$="[illegible]":GOSUB500:SYS7662
20 PRINT"[illegible]SCORE 00000":W=15-S
30 SYS7504 POKE6959,20-V:T=0
40 POKE8030,17:POKE8031,2:POKE36878,15
50 E=INT(RND(1)*15)
60 PRINTA$,"[illegible]TIME:[illegible]"
70 PRINTA$"[illegible]"SPC(E)"[illegible]"
80 FORA=3TO20STEP3
85 X=INT(RND(1)*15):IF(X>Y-3ANDX<Y+3)OR(A=3ANDX>7ANDX<14)THEN85
90 PRINTLEFT$(A$,A);TAB(X);"[illegible]":Y=X:NEXT
100 SYS6912
120 P=PEEK(824):IFP<>0ANDP<>11THENSYS6773:GOTO220
125 SYS6926:IFP=11THEN200
126 T=T+1:IFT=WTHENSYS6400:T=0
130 SYS6144:GOTO120
200 PRINTA$"[illegible]"SPC(E)"[illegible]":W=W-2:IFW<1THENW=1
210 POKE36877,0:SYS6224:SYS6400:GOTO30
220 SYS6630:POKE36877,160:FORA=15TO0STEP-1
230 POKE36878,A:SYS6350:FORS=0TO150:NEXT
240 SYS6343:FORS=0TO150:NEXT:NEXT
244 POKE36877,0:LV=LV+1:IFLV<3THENSYS6600:GOTO30
250 PRINTLEFT$(A$,11)SPC(6)"[illegible]GAME OVER":FORA=0TO5000:NEXT:RUN
500 POKE36879,14:POKE36869,240:PRINT"[illegible]"
510 FORA=0TO21:POKE7680+A,160:POKE38400+A,AAND7
520 POKE8164+F,160:POKE38884-A,AAND7:NEXT
530 PRINT"[illegible]"
531 PRINT"[illegible]"
532 PRINT"[illegible]";SPC(7);"[illegible]"
533 PRINT"[illegible]";SPC(12);"[illegible]"
534 PRINT"[illegible]";SPC(15);"[illegible]"
535 PRINT"[illegible]";SPC(17);"[illegible]"
536 PRINTLEFT$(A$,10)"[illegible]BY DAVID HODGETTS."
537 PRINTLEFT$(A$,21)"[illegible]PRESS FIRE TO PLAY"
540 PRINTLEFT$(A$,14)"[illegible] START VELOCITY:";V
550 PRINTLEFT$(A$,17)"  ASTEROID SPEED:";S
560 GETC$:IFC$="[illegible]"THENV=V+1:IFV>9THENV=0
570 IFC$="[illegible]"THENS=S+1:IFS>9THENS=0
580 SYS6885:SYS7632:FORD=0TO150:NEXT
590 IF(PEEK(37151)AND32)<>0THEN540
600 RETURN
```

Toolkit

H Geradts,
The Hague,
The Netherlands.

SPECTRUM

TOOLKIT COMBINATION is a machine-code program which allows the user of the ZX-Spectrum with only one USR instruction to get a variety of information about a Basic program as well as about one written in machine code. Several of the routines have been published before, but the disadvantage of these is that you have to keep track of a series of addresses.

Access of a machine-code instruction directly from Basic as was done in the program published in *Your Computer*, September 1983 by Gary Rees causes troubles because the Spectrum seems to dislike the IM2 instruction.

Toni Baker warns against using the IM instruction on page 102 of her book on machine code. After some time a system hang-up appears to occur. Nevertheless, Gary Rees' program is quite interesting because it gives a useable way of printing numbers on screen.

The same method has been used in this program: the program gives a menu of the options — analyse memory, the hex/dec, dec/hex converter and some smaller routines are adapted from the program Supercode by CP-Software and are published with its

(continued on page 134)

(continued from page 133)

permission. Now a short description of these options.

Analyse Memory: This gives the address you have chosen, the decimal value, the hexadecimal value and the character — where printable — in the address. You can choose the first address by Randomise no: USR! — address. All the following addresses are printed until the screen is full. The Scroll? message is then printed. If you press n you are back in Basic, but it is possible to get the menu back if you have put the instruction:

RANDOMIZE USR 64360 in a Basic line

The options Memory free, Proglength, Varlength, Pro. + vars do not need any explanation. Neither does the option Ramtop. You have only to press the letter behind these options to see the value of these parameters printed on the screen.

The second option in the menu is Frames + sound. This is not a very useful routine but more something like a demonstration that Spectrum does have a clock inside.

You can get back to the menu by pressing Z. Z is also used to get back to Basic. That is the way to get into Basic without Caps Lock, because the machine-code is programmed to be used with capitals. It has other features, which I hope you will like: Paper and Border blue, Ink white and a more audible sound from the keyboard. These are permanent in Basic until you change them back. With Interface 1 connected CLS # will change the colours to black and white.

Breaking out of the machine-code with Caps Lock-Break is possible too. There are three other options which I didn't mention. Line address, UDG, and 3. The first is quite straightforward. Put the cursor in a Basic line, and L will tell you the address of the first character the cursor points to. Easy to see where a Basic program ends. UDG again uses the variable Seed. If you have your own UDGs somewhere in memory, e.g. 40000, use Randomize 40000, go to the menu and press U. To get back to the Spectrum UDGs you can use the S.

The last option is pressing 3. This is not mentioned in the menu. It sets the Microdrive variables — with Interface 1 connected — and gives a yellow flashing Border when Saving etc on Microdrives.

Now for the Basic program. The machine-code is exactly 1000 bytes long. Each Data statement is one hundred bytes. Type it in and run it. Three things can happen. You have all the numbers typed in correctly — congratulations, I never succeed in doing that. Then the program will run to the end. If on the other hand you forget a number or type more than 100 numbers in one statement you can expect the Spectrum to give the somewhat unfriendly message "Nonsense in Basic", because it is reading a numerical Data instead of a string variable. Another possibility is typing a wrong number.

The program then gives the Line in which the error has occurred. It contains no safeguards against typing two or more faulty numbers, if the sum is the same as that of the correct ones. So it is advisable to Save the Basic program before trying the machine code. Once the machine code works as expected, you can New the program, but make sure first that machine code is Saved. Never try to load the machine-code before lowering Ramtop — Clear 64359.

```
  1 REM Toolkit combination by
        H. Geradts, The Hague,
        The Netherlands
        This program contains
        several routines from
        "SUPERCODE" BY
        CP SOFTWARE ENGLAND
  2 CLEAR 64359
  3 RUN 1000
  50 DATA 205,164,253,24,9,225,1
28,35,229,167,200,215,24,247,175
,50,60,92,205,109,251,17,2,16,7,
65,110,97,108,121,115,101,32,109
,101,109,111,114,121,58,32,65,13
,72,114,97,109,101,115,43,115,11
1,117,110,100,58,32,75,43,67,13,
62,202,97,100,100,114,101,115,11
5,58,6,75,13,77,101,109,111,114,
121,32,102,114,101,101,58,6,77,1
3,80,114,111,103,108,101,110,143
,116,104,58
  51 DATA "5692"
  52 DATA 6,80,13,60,114,111,103
,32,43,32,118,57,114,115,58,6,84
,13,82,97,109,116,111,112,58,6,8
2,13,86,97,114,108,101,110,103,1
16,104,58,6,86,13,65,68,71,58,24
9,6,32,13,97,120,100,114,101,115
,116,6,85,13,85,68,71,32,83,112
101,99,116,114,117,109,58,6,83,1
3,72,101,120,45,62,68,58,72,69,6
8,101,99,45,62,72,58,68,13,69,12
0,105,116,40,108,48
  53 DATA "7649"
  54 DATA 99,97,115,101,41,58,6,
90,22,14,10,18,1,62,62,6,229,175
,62,6,216,175,17,156,0,33,100,0,
205,181,3,253,203,1,174,253,203,
1,110,40,250,58,8,92,211,63,254,
90,202,172,252,254,76,202,32,253
,254,78,202,56,254,254,65,202,19
7,253,254,66,202,185,254,254,80,
40,98,254,77,40,105,254,51,204,1
61,254,254,82,202,24,253,254,86,
40,109,254,84,40,62,254,65,40
  55 DATA "12829"
  56 DATA 34,254,83,40,39,254,70
,40,106,197,205,142,2,193,33,32,
30,167,237,82,40,11,24,173,245,1
75,50,106,92,241,195,96,253,225,
201,42,116,92,34,123,92,215,24,1
30,42,180,92,17,167,0,237,82,34,
123,62,215,106,66,252,205,153,25
3,42,89,92,237,91,83,92,237,82,2
4,80,205,153,253,42,75,92,237,91
,83,52,237,82,24,66,205,153,253,
42,178,92,237,91,101,92,237,82,2
4
  57 DATA "12319"
  58 DATA 52,205,153,253,237,91,
75,92,42,89,92,237,82,24,38,215,
205,154,253,42,161,92,245,126,21
1,63,241,42,120,92,24,21,205,153
,253,42,178,92,24,13,205,153,253
,42,73,92,205,110,25,35,35,35,35
,1,240,216,205,165,253,1,24,252,
205,105,253,1,158,255,205,105,25
3,1,246,255,205,105,253,1,255,25
3,205,105,253,253,203,1,110,40,9
30,58,8,92,254,70,40,176,254,81,
202,10
  59 DATA "13363"
  60 DATA 255,195,66,252,253,33,
58,92,205,241,251,207,255,-76,9,
60,56,252,237,66,61,198,48,289,2
05,131,251,33,249,91,52,42,249,9
1,205,144,253,225,201,237,75,54,
92,30,0,111,41,41,41,89,235,201,
6,8,26,-19,36,19,16,250,201,215,
33,205,72,34,249,91,33,0,0,201,6
2,6,50,-106,92,62,56,50,57,92,62,
1,211,254,62,15,50,141,92,50,72,
92,211,-27,205,107,-13,62
  61 DATA "11648"
  62 DATA 2,205,1,22,201,205,188
,253,62,68,215,62,58,215,239,160
,55,205,142,2,123,254,255,32,248
,205,142,2,32,251,22,0,205,30,3,
48,244,254,13,40,26,254,90,48,71
,254,48,56,224,254,58,48,220,245
,215,241,205,34,45,239,1,164,4,1
5,56,24,205,205,162,45,56,38,62,
32,215,62,61,215,62,32,215,237,6
7,254,91,8,14,175,33,254,91,237,1
11,35,237,111,198,48,254,58
  63 DATA "12254"
  64 DATA 48,10,215,15,238,62,13
,215,24,154,207,5,198,7,24,242,1
95,184,251,205,188,253,62,72,215
,62,58,215,33,254,91,54,0,35,54,
0,205,142,2,123,254,255,32,248,2
05,142,2,32,251,22,0,205,30,3,48
,244,254,13,40,41,254,90,40,208,
254,48,56,224,254,71,48,220,254,
58,56,4,254,65,56,212,245,215,24
1,214,48,254,10,56,2,214,7,33,25
4,91,237,11,35,237,111,24
  65 DATA "2237"
  66 DATA 191,62,32,215,62,61,21
5,62,32,215,237,75,254,91,205,43
,45,205,227,45,62,13,215,24,153,
17,5,1,33,200,6,205,151,3,62,35,
205,155,253,207,49,62,6,50,198,9
2,195,66,252,205,188,253,42,116,
92,235,33,177,92,66,75,229,213,2
05,43,45,205,227,45,209,225,62,3
2,215,26,119,43,54,0,205,40,25,6
2,32,215,62,32,215,26,6,2,175,23
7,111,198,48,254,58,48,22
  67 DATA "11410"
  68 DATA 215,16,244,62,32,215,6
2,32,215,235,126,254,32,56,11,21
5,52,13,215,35,24,189,198,7,24,2
30,62,63,24,241,17,5,1,50,110,92
,254,2,56,24,71,197,33,0,3,17,1,
0,229,205,181,3,225,17,16,0,167,
237,82,32,240,193,16,233,62,240,
211,63,6,65,118,16,253,62,15,211
,63,6,66,118,15,253,197,205,142,
2,193,33,32,39,167,237,82,40,2,2
4,189,195,104,25
  69 DATA "10391"
 100 SAVE "TLK"CODE 64360,1000
 102 PRINT "Machine-code now SAV
ED.":"Are you sure all the DATA
are correct?(y/n)":"If not t
hen SAVE this ";"program too!":
INPUT q$
 104 IF q$="y" OR q$="Y" THEN GO
TO 9999
 900 STOP
1000 LET LINE=18: PRINT AT 4,3;
INVERSE 1;"READING DATA ": PRINT

1001 DIM a$(10,5): DIM s(1000):
LET t=0: LET w=0: LET x=64360: F
OR m=1 TO 1000: READ s(m): POKE
x,s(m): LET t=t+s(m): LET x=x+1
1005 IF m>1 AND m=100 OR m/100=I
NT (m/100) THEN GO SUB 1050
1010 NEXT m
1030 GO TO 100
1050 LET LINE=LINE+2: LET w=w+1:
 PRINT PAPER 2;LINE,t: READ a$(w
): IF VAL a$(w,(2)<>t THEN PRINT "E
rror in LINE ";LINE: STOP
1070 LET t=0: RETURN
9000 STOP
9999 RANDOMIZE USR 64360


Listing 2
9990 REM Toolkit
9992 CLEAR 64359
9994 LOAD "TLK"CODE 64360
9996 RANDOMIZE USR 64360
```

Drums

Stephen Payne, Ipswich

AMSTRAD

THIS PROGRAM simply plays a drum rhythm. Realistic effects have been achieved by using the Env commands. ■

Amstrad Drums.

```
5 s=1
10 'drums **** S.Paine 4/11/84
15 MODE 0
20 CLE:LOCATE 8,11:PRINT"DRUMS"
30 ENT -1,1, 127,1,5,24,1
40 ENV 1,1,15,1,5,-3,2
50 ENV 2,15,-1,10
60 FOR t= 1 TO 4
65 IF s>2 THEN s=1
66 IF s=1 THEN ch=1
67 IF s=2 THEN ch=4
70 FOR y=1 TO 3
80 FOR o=0 TO 100:NEXT o
90 TOn=(t+4)*54
100 SOUND ch,ton,6,0,1,1,1
110 NEXT
120 s=s+1:NEXT:ch=5:s=1
130 FOR t=0 TO 90:NEXT
140 SOUND 2,0,150,15,2,0,1
150 FOR p= 1 TO 3
160 SOUND ch,486,6,15,1,1,2
170 FOR t=0 TO 360:NEXT
180 SOUND ch,300,6,0,1,1,2
190 FOR t=0 TO 180:NEXT
200 SOUND ch,300,6,0,1,1,2
210 FOR t=0 TO 180:NEXT
220 SOUND ch,486,6,15,1,1,2
230 FOR t=0 TO 360:NEXT
240 SOUND ch,300,6,0,1,1,2
250 IF p<3 THEN FOR t=0 TO 360:NEXT
260 IF p=3 THEN FOR t=0 TO 240:NEXT
270 NEXT p
280 GOTO 60
```

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Simon Rollins with an updated version of the YC index. The first digit after the reference refers to the volume number, the second to issue number and the third to the page on which the reference occurs.

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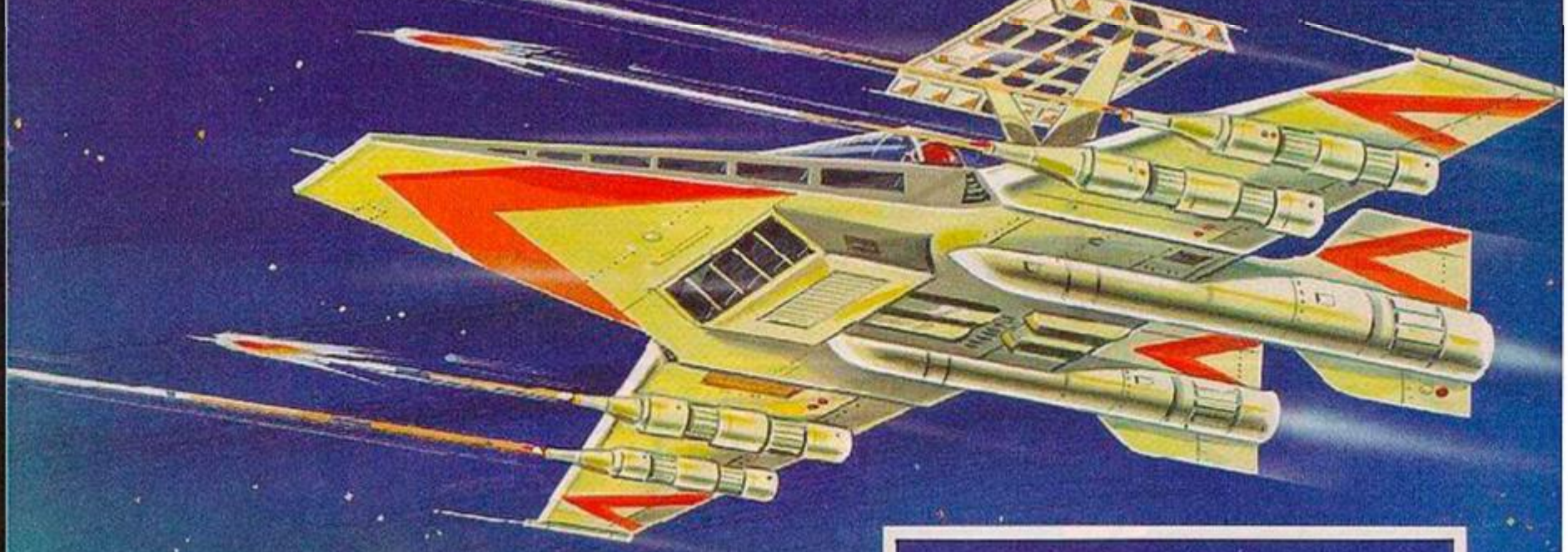
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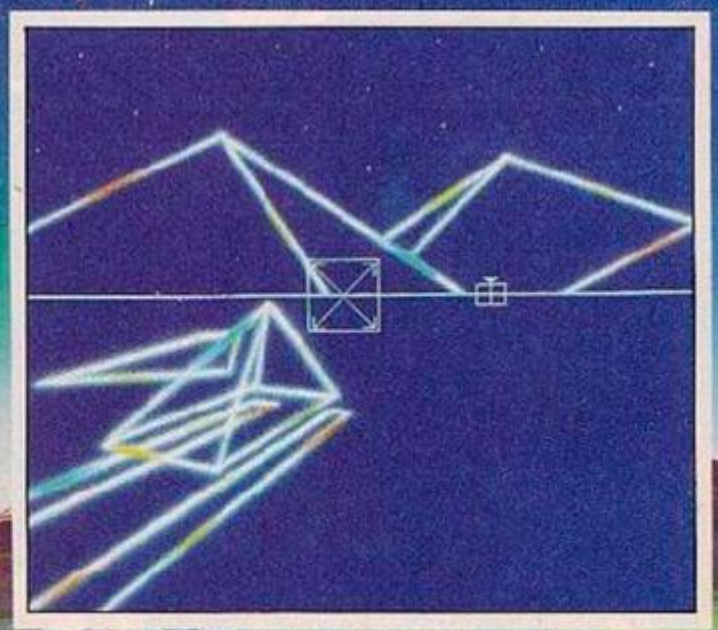
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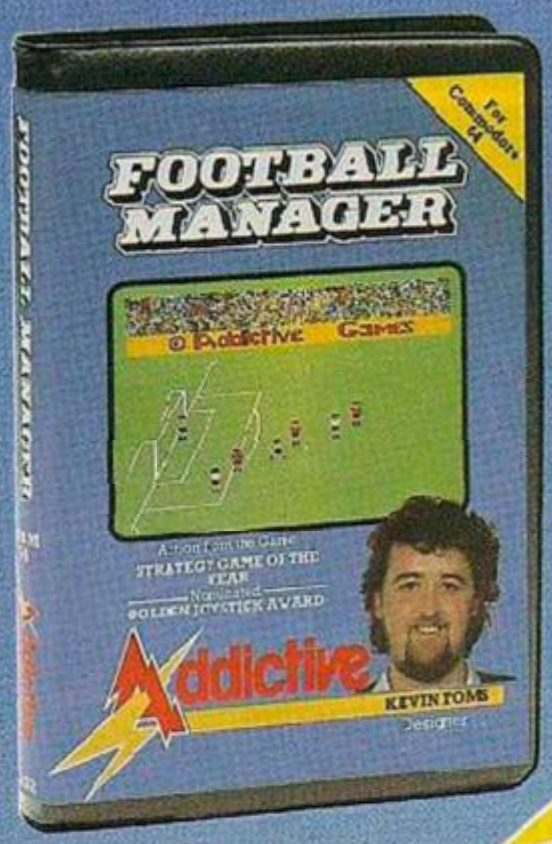
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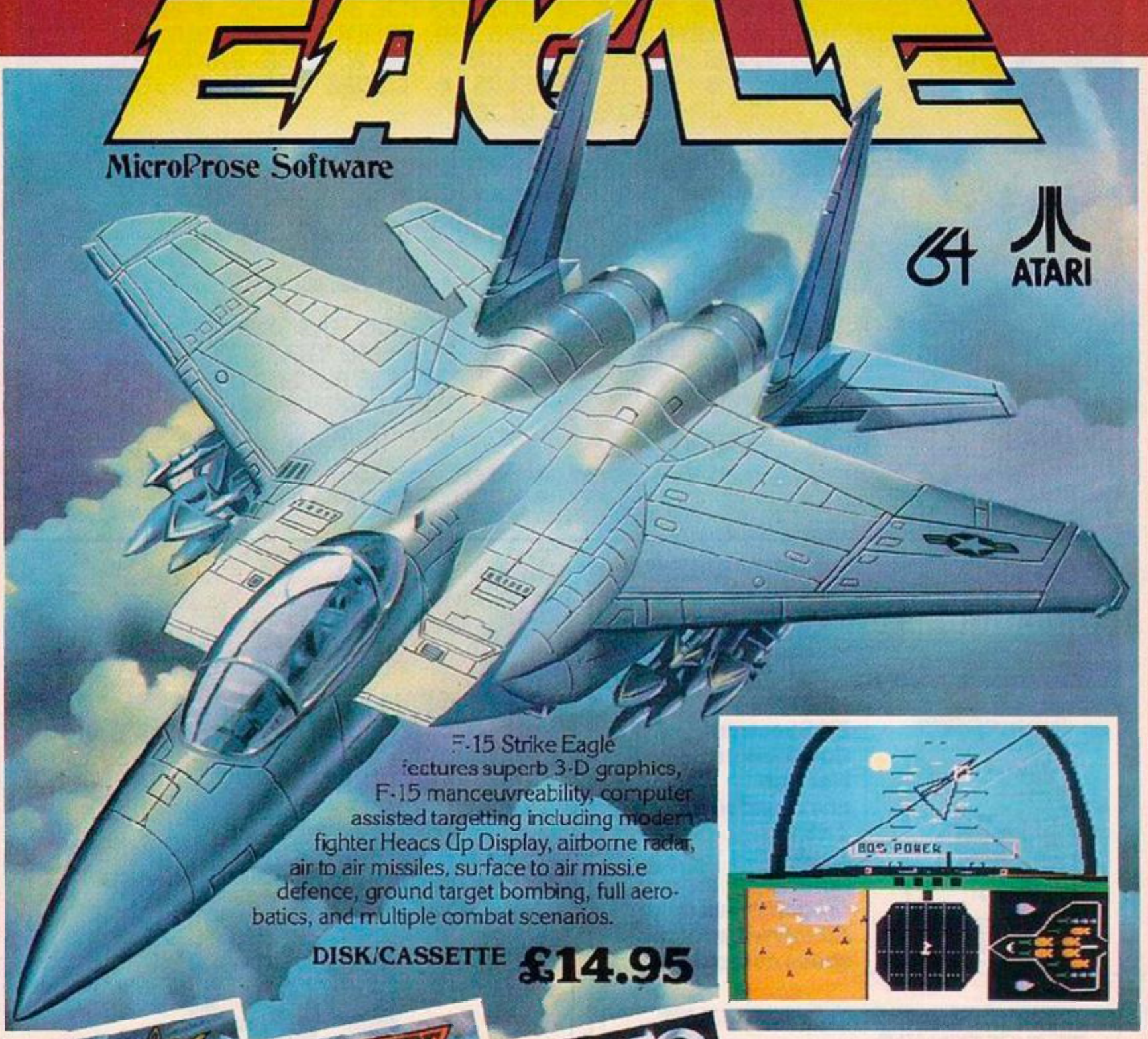
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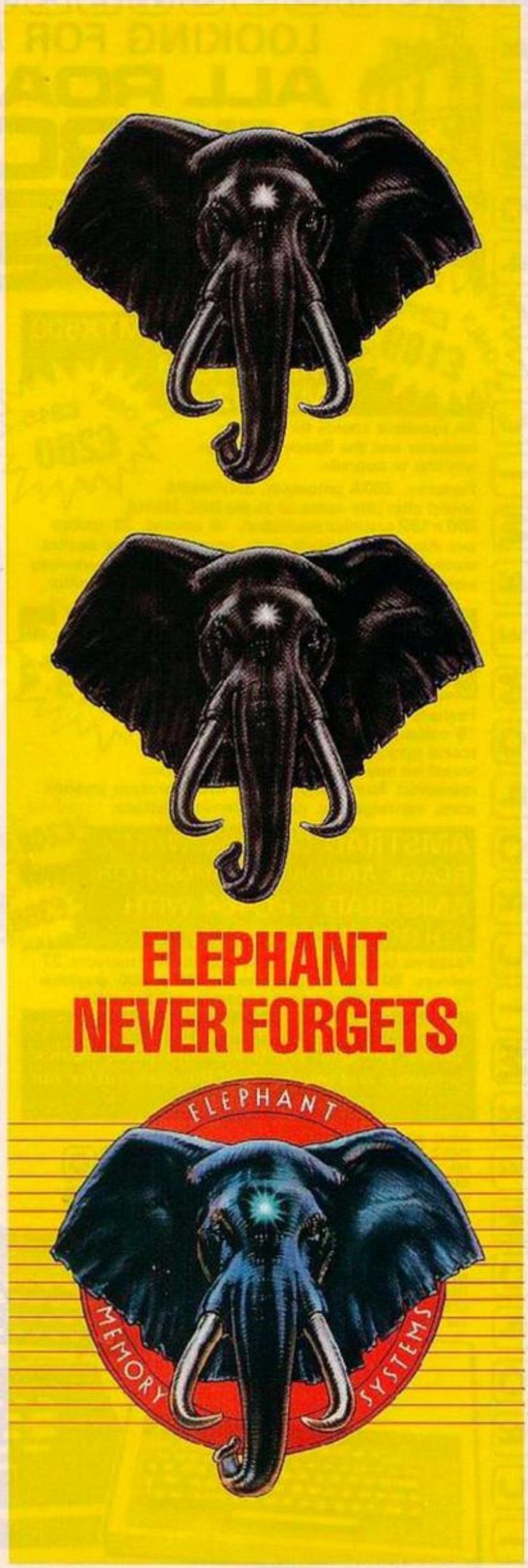
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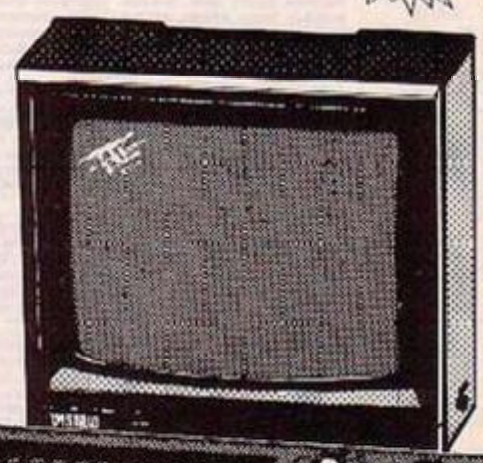
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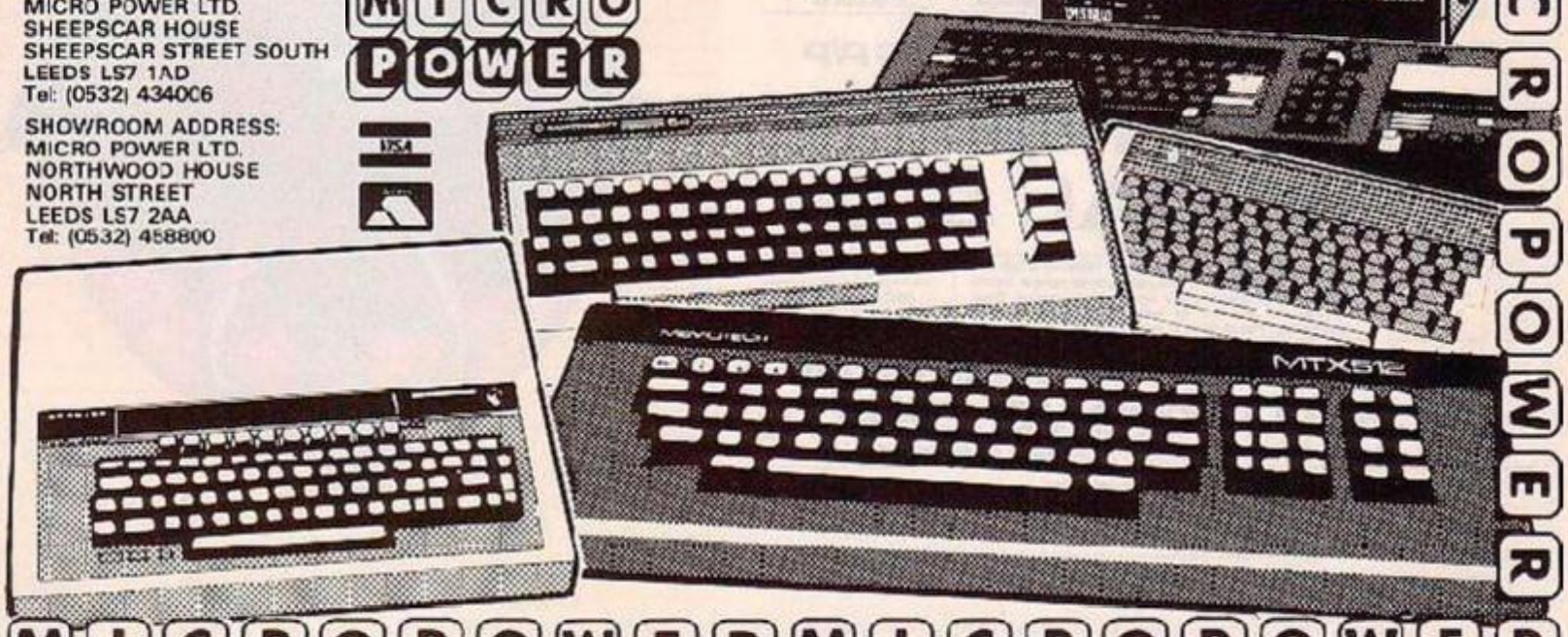
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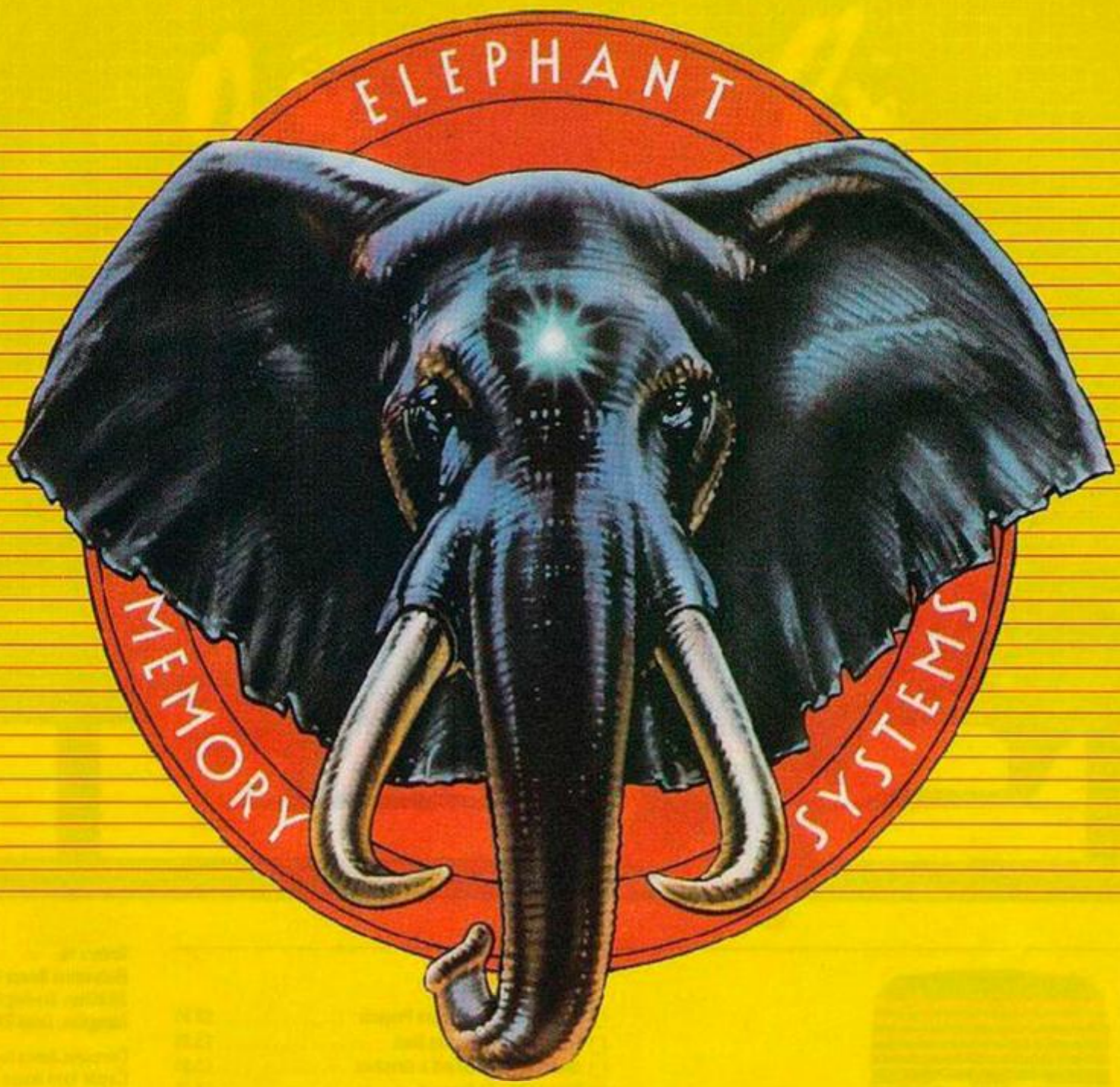
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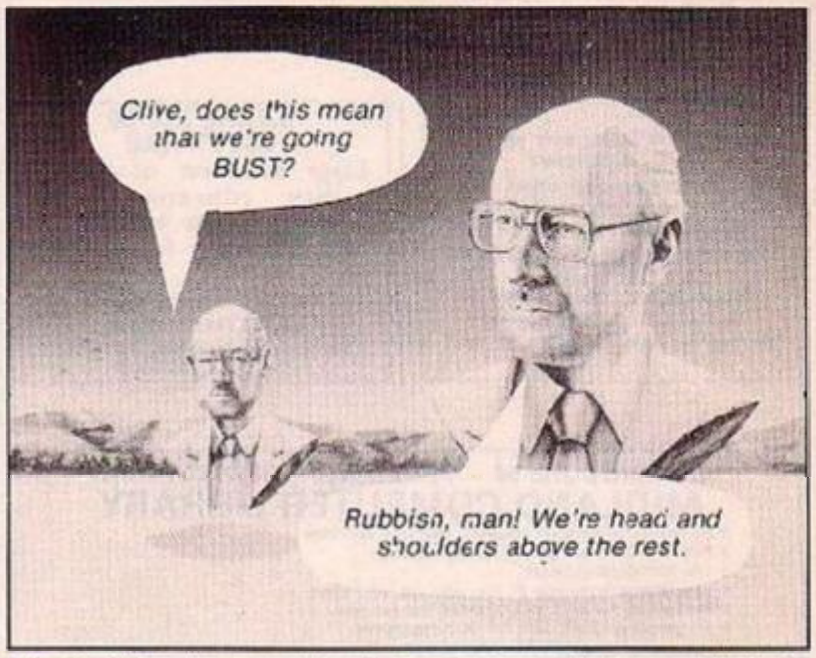
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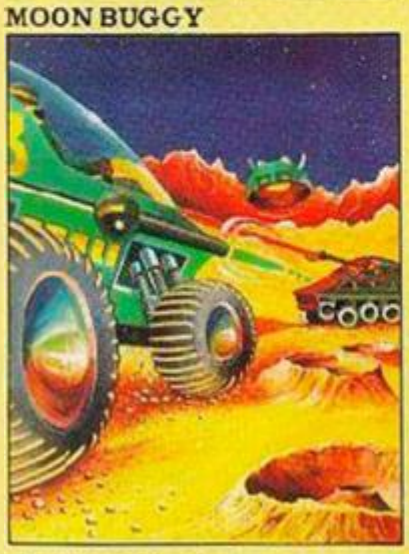
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COMMODORE C16 AND PLUS 4

LAS VEGAS

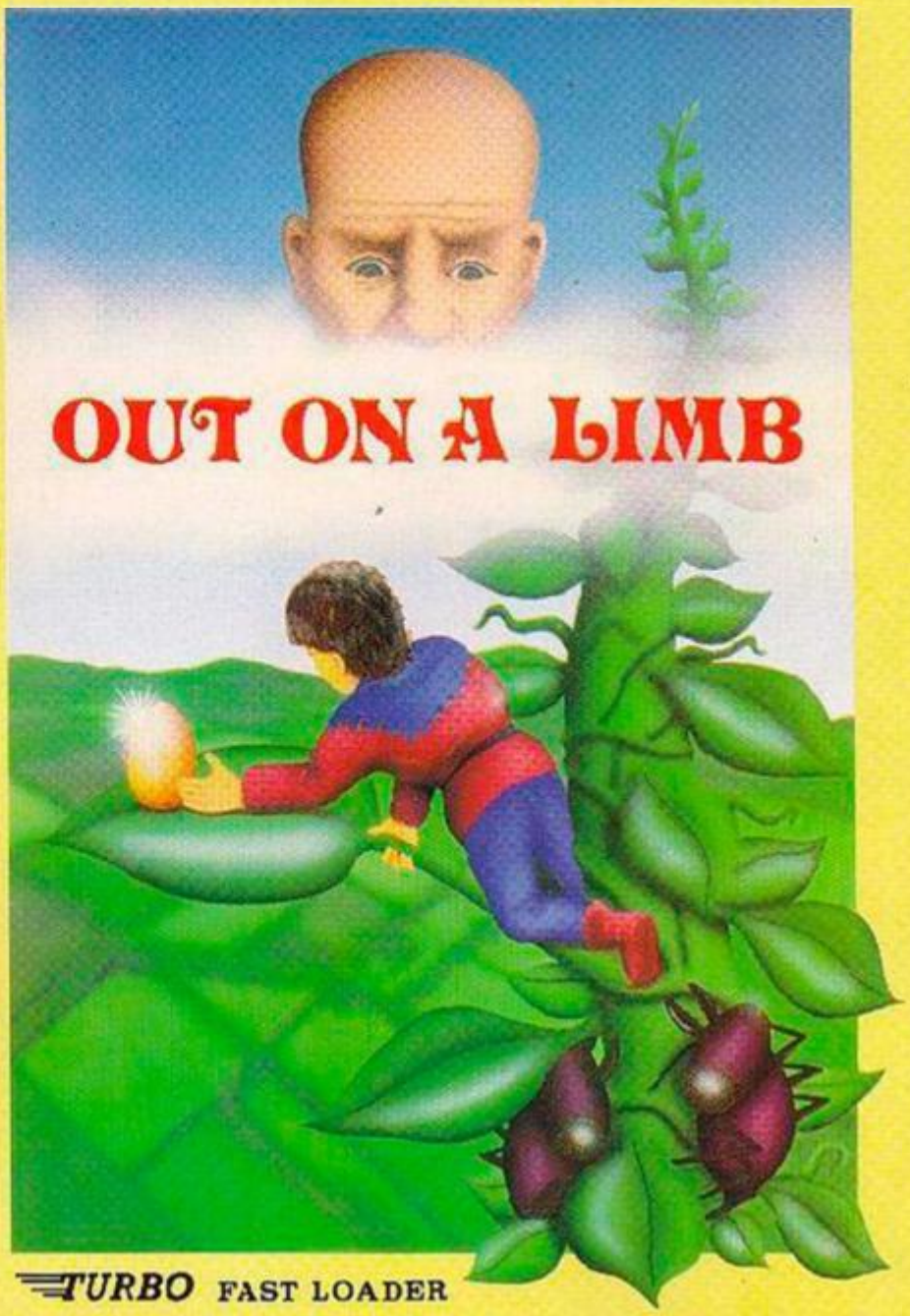


MOON BUGGY



FLIGHT PATH





ZODIAC



3D TIME TREK



SKRAMBLE



TURBO FAST LOADER

LAS VEGAS Las Vegas brings all the challenges of a deluxe arcade fruit machine direct to your fingertips. Many exciting features include, gamble, cancel, collect, nudge and number options, with a three row display and maximum payout of 20$.
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ZODIAC This is an enthralling arcade adventure in which the evil powers of hell have scattered the signs of the Zodiac in the four hundred chambers of the abyss. Struggle to collect these signs and at the same time try to annihilate everything in your way. How long can you stay alive?
J.S. or K.B. C.16 £6.95

PETCH Race Petch around the screen, moving ice blocks to alter the maze, however, beware of the nasty monsters who are constantly chasing Petch as you attempt to collect the bonus cherries. Also if you can touch the edge of the maze the monsters will suddenly burst into flames, but look out they'll soon be back!
J.S. or K.B. C.16 £6.95

MOON BUGGY You must skillfully manoeuvre your jumping patrol vehicle over dangerous moon craters as well as large boulders and cunningly placed mines. Not only this but avoid the hovering alien spaceship as it bombards you from above.
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3D TIME TREK As sole survivor of the planet "Corillian" your quest is one of anger and revenge. The starship you are flying is full of the latest inboard computers and extra powerful sensors. Also included are full 3D graphics, to add unbelievable realism to this fantastic journey through time itself, and beyond.
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SKRAMBLE Earth has been overrun by the Cobrons and its up to you to battle through the six ferocious and testing sectors. Adversaries include meteors, UFO's and deadly fireballs. Fly through an armoured city, then an elaborate maze and finally the command base itself.
J.S. or K.B. C.16 £6.95

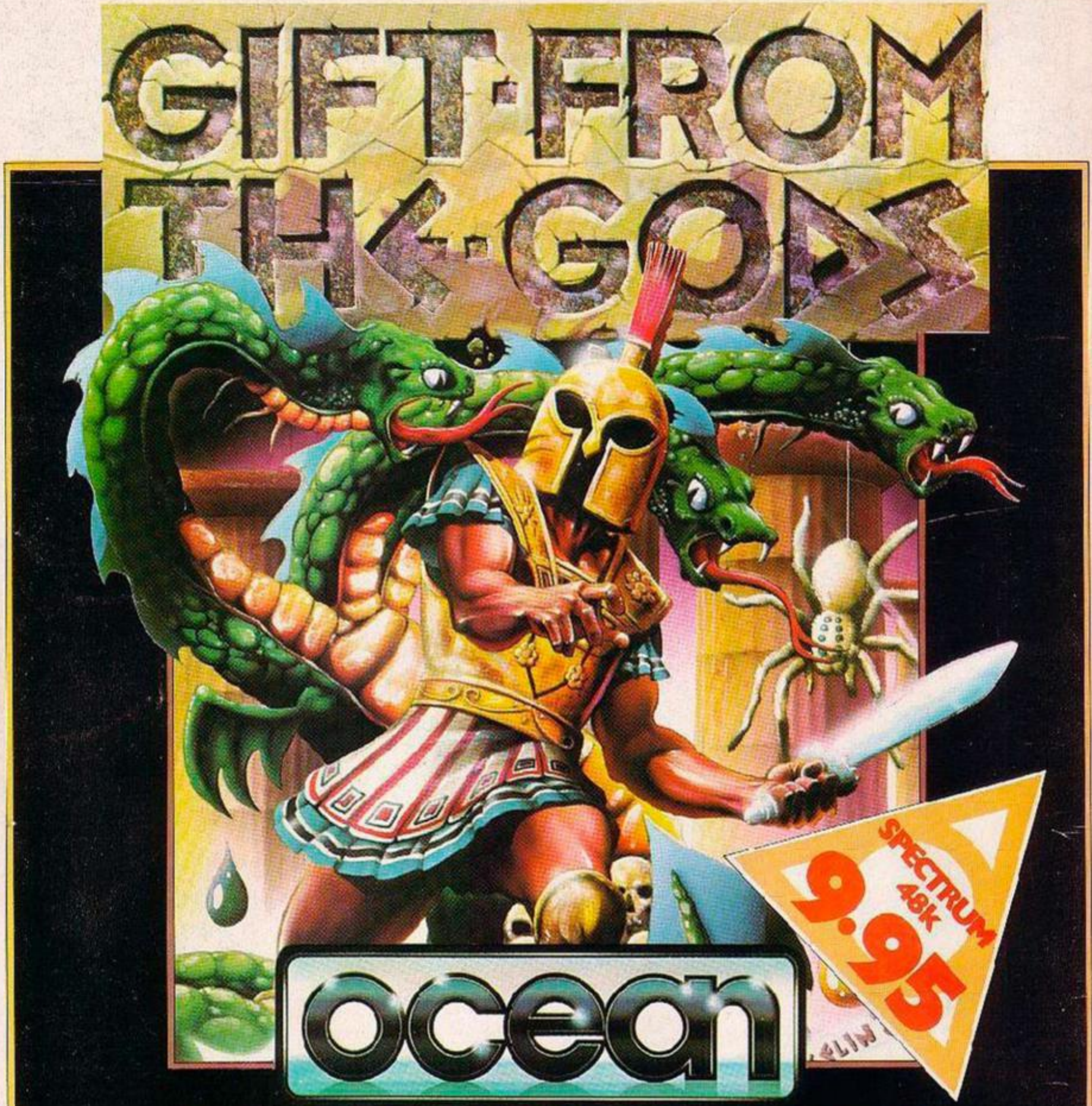
FLIGHT PATH Flight Path is without doubt the best flight simulator on the C/16 and Amstrad. The many elaborate features include; Altometer, flaps, directional headings, crosswinds, fires, ground warning lights and reverse thrust to name but a few. Also included are smooth graphics as you take off, cruise over mountains, and land once again.
J.S. and K.B. C.16 £6.95

OUT ON A LIMB This is a fantastic and in parts outrageously funny game. Based on the fairytale of Jack and the Beanstalk, Out On A Limb is full of the most strange and eccentric characters you are ever likely to meet. Firstly, climb the stalk and jump onto the clouds, then enter the giant's castle searching for treasures. However, watch out for vacuum cleaners, musical notes, televisions and potted plants, all of which chase you round the many and elaborate rooms of the castle. Once the treasure is collected the single exit will be opened, and then.....?
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